INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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CONTENTS

Accidents and Safety Education, *by Wayne M. Judy* 267
Industrial-Arts Objectives, *by George C. Decker* 269
Operating on a Reduced Budget, *by Ross C. Cramlet and William L. Hunter* 271
Conservatism vs. Extremism, *by Towne R. Abercrombie* 273
Using Linoleum Blocks, *by Aaron Keil* 275
Electrotyping, *by R. Randolph Karch* 276
Editorials 280
Handling Large Classes, *by Harold J. Van Westrienen* 282

Supplements

Letter Holder, *by J. I. Sowers* ..... No. 273
Framing Chart—II, *by K. L. Julson* ..... No. 274

Problems and Projects

Letter Holder, *by J. I. Sowers* .. 284
A Paring Knife, *by Norman Brooks* 284
A Floor Lamp, *by Jonathan Bright* 284
Homemade Rabbet Plane, *by Carl v. Lindeman* 285
A Good-Night Candlestick, *by Hazel F. Showalter* 285
Simple Ash Tray, *by Ralph S. Smith* 286
A Handy Trammel, *by William E. Haynes* 286
A Chimney Iron, *by H. M. Andersen* 287
Fireplace Set, *by Gerald A. Boate* 288
Hot-Dish Pad, *by C. M. Jochem, Jr.* 290
The Development of an Oblique Cone, *by Howard C. Nelson* .. 290
A Fishing-Tackle Box, *by C. A. Van Kammen* 291
A Paper Cutter for the Drafting Room, *by Homer Baldwin* ... 292
Portable Exhibit Case, *by A. P. Twogood* 293
Art Moderne Sewing Chair, *by Herbert Bast* 294
Small Flood Light, *by B. D. Elliott* 295
Projects Made of Angle Iron, *by Rowland L. Hill* 297
Music Rack, *by M. L. Klein* ... 298
Woodshop Duster, *by W. A. DeVette* 299
Tea Tray, *by L. J. Webster* 299
Magazine Basket, *by A. M. Helgerson* 300
Metal Candle Holder, *by L. Henderson and H. G. Stintsman* .. 301
Saving Type on Imprints, *by R. Randolph Karch* 301
A Sediment Can, *by E. G. Livingston* 301
Metal Fern Stand, *by H. O. Jaeger* 302

Personal News 302
Associations and Conventions 302
Some Questions Answered 7A
New Publications 7A
School Shop Equipment News 9A

THE SEPTEMBER ISSUE

Anticipating the favorable results of the new deal promised by the N.R.A., the publishers in this Problems and Projects Number portray in quantity of editorial material the advent of the prosperous times for which America is hoping.

PROBLEMS AND PROJECTS NUMBER

The problems and projects appearing in this issue, it is hoped, will be of special help, either directly or inspirationally, for many teachers who are now planning their work for the coming school year.

The general articles by Messrs. Judy, Decker, Cramlet and Hunter, Abercrombie, and Van Westrienen were chosen for this issue because of their timeliness. They should not be overlooked.

THIS MONTH'S COVER

The picture chosen for the cover this month shows how bench molding is done in an aluminum foundry.

Photograph courtesy of Aluminum Company of America, Pittsburgh, Pa.

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
September, 1933
Vol. 22, No. 9

Accidents and Safety Education

Wayne M. Judy

Industrial-Arts Instructor,
Clear Lake, Iowa

Industry has done some remarkable things in the way of accident prevention through safety education. The school-shop teacher must clearly recognize his responsibility in embodying this type of education in all of his courses. The results of the author's study are very significant.

SAFETY education is especially important in the present age because industry and society as a whole are demanding safe workers as never before. The machine age in which we live makes work as well as living extremely hazardous. Accidents occur today that were never dreamed of by our forefathers even as late as thirty years ago, and we are confronted by the problem of obviating at least some of these mishaps in some way or other.

Industry has proved that the most effective way to train safe workers is by developing safety consciousness through safety education. It follows logically, then, that if industry and society as a whole are demanding safety consciousness from their workers and members, it is the duty of the American public school to try and furnish the necessary education.

Miss Idabelle Stevenson, executive secretary for the National Safety Council, in a survey of the schools teaching safety education as a part of their regular curriculum, found that the problem method and the demonstration method were the most effective means of teaching safety.

Dr. Max Henig, of Essex County Vocational School, Bloomfield, N. J., made a study which proved that more accidents per pupil occur in the shop than elsewhere in the school building. This points out the fact that the industrial-arts shop is the logical laboratory for the giving of safety education.

From a survey of automobile accidents made in 1930 by Dr. Herbert Stack, it was found that in the preceding five years there had been a 25-per-cent increase in adult accidents, a 10-per-cent in preschool accidents, but a 20-per-cent decrease in accidents to school children. This large percentage of decrease in the case of the school children shows the results obtained from giving safety education in the school.

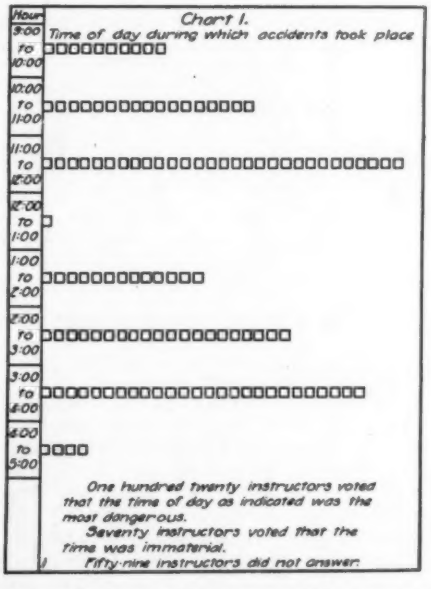
If the school as a whole can bring about such desirable results, the school shop should be able to do as much in cutting down shop accidents. For this purpose the following study[1] of accidents and safety education as found in the industrial-arts shops of Iowa was made by the writer.

[1]This study was supervised and approved by Professor William L. Hunter, of Iowa State College, Ames, Iowa.

Purposes of Study

The specific purposes of this study are as follows:

1. To gather and classify shop accident statistics.
2. To determine the relative frequency of the various shop accidents.
3. To determine which are the most dangerous hand and machine tools.
4. To determine the methods of safety education now in use.
5. To collect first-aid information.


Hour
Chart I.
Time of day during which accidents took place
8:00 to 10:00
10:00 to 11:00
11:00 to 12:00
12:00 to 1:00
1:00 to 2:00
2:00 to 3:00
3:00 to 4:00
4:00 to 5:00
One hundred twenty instructors voted that the time of day as indicated was the most dangerous.
Seventy instructors voted that the time was immaterial.
Fifty-nine instructors did not answer.

6. To determine how rigidly the school shops are inspected for safety.
7. To determine the causes of school-shop accidents.

The data presented herewith was gathered by the questionnaire method. Answers were received from 252 of industrial-arts instructors in Iowa. They cover a period of sixteen school months.

Accident Data

1. The total number of accidents requiring medical treatment 726
2. The number of accidents with hand tools..... 552
3. The total number accidents caused by power-driven machinery 156

4. The number accidents treated by a physician 113
5. The number that resulted in the loss of any part of the body 18
6. The number that resulted in the loss of one or both eyes.. 12
7. The number that resulted in the loss of bodily member.. 6

First-Aid Data

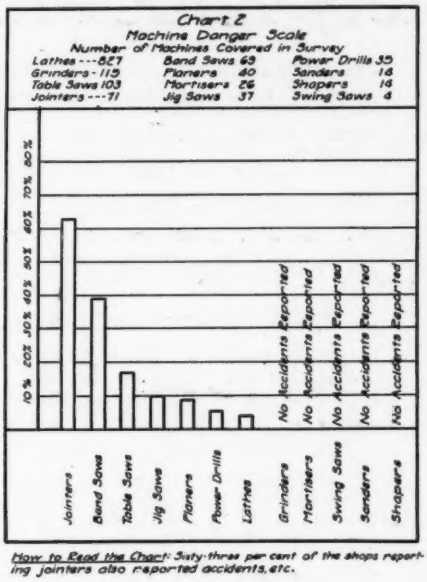
1. Shops having first-aid cabinets 183
2. Shops without first-aid cabinets 14
3. Instructors not answering 32
4. Instructors reporting cabinets in good condition 98
5. Instructors reporting cabinets in fair condition 31
6. Instructors reporting cabinets in poor condition 13

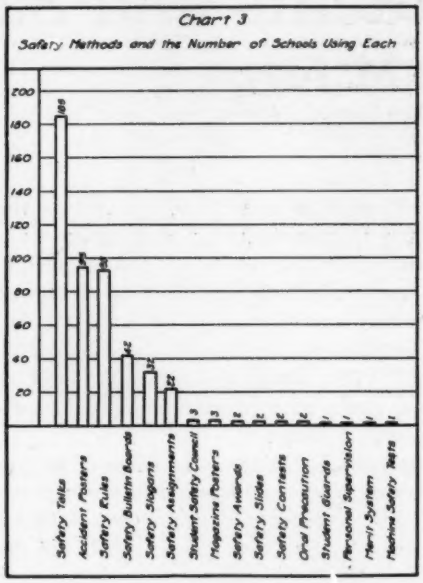
Power Machinery Data

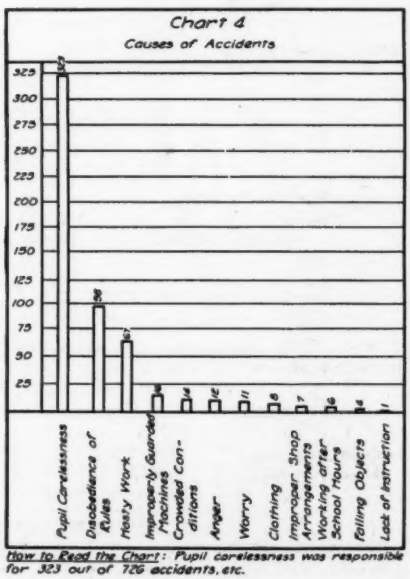
1. Schools equipped with power machinery 162
2. Schools not equipped with power machinery 74
3. Instructors not answering 12
4. School boards who are in favor of the use of power machinery 155
5. School boards who are not in favor of the use of power machinery 54
6. Instructors who were not able to give the opinion of their board of education as to this subject 22
7. Instructors who did not answer 18
8. Schools requiring machine permission slips from parents.. 23
9. Schools not requiring machine permission slips 162
10. Schools not answering 64

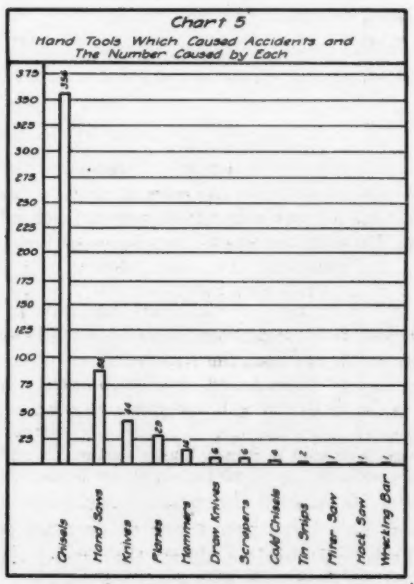
Safety-Inspection Data

The term "inspection" here is used in reference to inspection outside of the regular school system, that is, county or state safety inspection.









1. 156 schools reported ..... 0 inspections
2. 15 schools reported ..... 1 inspection
3. 13 schools reported ..... 2 inspections
4. 3 schools reported ..... 4 inspections

The charts which were worked out in conjunction with the study and presented with this article are practically self-explanatory.

Conclusions

The findings of this study lead one to conclude:

1. That there is a definite need for more safety education in the industrial-arts shops of Iowa. This seems a safe con-

clusion because there was an average of over three accidents for every shop reported in the survey.

2. That there is a definite need for instruction relative to the safe use of the following hand tools: (*a*) Wood chisels, (*b*) handsaws, (*c*) knives, (*d*) planes, (*e*) hammers.

3. That there is a definite need for instruction relative to the safe use of the following machine tools: (*a*) Jointers, (*b*) Circular saws, (*c*) Band saws. It is not to be inferred from the foregoing that the many other tools and machines are not dangerous, but from the results shown in the study, the above mentioned are causing the larger percentage of school-shop accidents.

4. That the shop instructors of the state are not taking their share of the responsibility in the problem of shop safety. This conclusion may be arrived at because the instructors reported 323 accidents which were caused by pupil carelessness and only one accident was reported as being caused by lack of instruction. Now surely if the instructors are responsible for the actions of their students within the shop, they would be responsible for more than one out of 323 accidents.

5. That the safety methods and devices which are employed at the present are not adequate, or there would not be such a high accident rate.

6. That the instructors are not as yet ready for the plan of shop liability insurance.

7. That the shops, as a rule, are supplied with first-aid equipment, although much of it is not in good condition.

8. That if 12 per cent of the accidents are caused by conditions which could be controlled by the school, there then should be some pressure brought to bear so that these conditions will be remedied.

9. That the industrial-arts shops of Iowa, and this no doubt, applies equally elsewhere are badly in need of a more thorough system of safety inspection.

Industrial-Arts Objectives[1]

George C. Decker

Fairview High School,
Dayton, Ohio.

Working without objectives is like touring without a map. Objectives, like maps, must be understood by those who are to be guided by them. The author of this article puts meaning into industrial-arts objectives.

The choice of industrial-arts objectives in the past has been based largely upon historic, traditional, or trade backgrounds. Application of the sociological approach, however, has contributed new conceptions to the formulation of these objectives. This newer approach is the one largely used in the interpretation of the following objectives. The first of these deals with the development of desirable *avocational interests*. H. C. McKown[2] says:

"As the amount of leisure at the disposal of the average man increases, so does the importance of a correlative objective — that of properly interesting and directing the pupil, or future citizen, in the wise use of leisure time. . . . The new school not only sets up worthy and reasonable ideals, but offers actual practice of these ideals."

In the construction of things, industrial arts is specifically able to give direction to adolescent impulses and activities. If then, leisure increases with future industrial development, we may need to give this subject more and more attention in the schools. Even now the average man spends more time in leisure than in work. The activities selected for schoolwork should carry over easily into adult life. The ancient ideal of craftsmanship is now carried on by choice and for pleasure. Witness the growth of home workshops, and of model building, and note the decided turn from professional amusements to independent activities which call upon the resourcefulness of the individual. Physiologists have found that adolescents are drawn strongly to the crude strength and gross muscular activities. Situations calling for the finer muscular coördinations lack the appeal that is present in games, hiking, swimming, and other outdoor activities. It would be reasonable, therefore, to expect that the voluntary constructive avocational interests of adolescent boys would tend to favor those activities that are related to games and the exercise of gross muscular skill.

Burl N. Osburn,[3] notes the following psychological fact:

"One may give a different interpretation to the term 'Avocational Interests' for adolescents than would be given for adults. An adult who has a hobby may spend hours every day for years, deriving intense satisfaction from increasing skill or wider knowledge of the subject of his interest. The adolescent who does this would be exceptional. In view of the psychological tendencies of adolescence, attention might be expected to be spontaneous, of relatively short duration, and possibly of widely selected ranges of interest."

Osburn concludes that in order to meet most effectively the social and psychological needs of the adolescent, the industrial-arts program should:

1. Provide a type of shop that will permit the use of a wide range of materials and processes.
2. Give opportunity for experimentation and expression of many kinds of interests.
3. Make allowance for the variable duration of interests, by a flexible course designed to fit individual cases.
4. Permit the boy to utilize the school shop, at least part time, for the working out of these avocational activities for which he lacks equipment at home.
5. Stimulate interests by a constantly changing exhibit of constructive hobbies of a great variety; the hobby fair is one such means.
6. Utilize all possible means of stimulation in avocational activities.
7. Discover and develop interests and abilities.
8. Exemplify the desirability of its teaching through an instructor who is absorbed in his own hobbies.
9. Keep close contact with other agencies or organizations whose purpose is similar in these respects.
10. Urge and assist boys in the general accumulation of a set of tools of their own.

A second objective deals with how to understand *consumer knowledges and appreciations*. One is astounded at the extent of industry's influence upon the individual citizen. *The intelligent choice and use of the products of industry* is the average citizen's best means of insuring ultimate independence. Dr. Bonser[4] stressed the consumer objective in industrial arts in the following manner:

". . . Be able to buy and use industrial products of good quality in material and construction and well adapted to their purposes, at costs that are reasonable; to care for what is secured so it will remain serviceable in its fullest possible measure; to repair or supervise the repairing, when it can be done to advantage; and to intelligently substitute inexpensive for expensive products, when this is needed."

---

[1] From an address given before the Western Arts Association, May 5, 1933.

[2] McKown, Harry C., *School Clubs*, p. 6. The Macmillan Company, New York City.

[3] Osburn, Burl N., *The Constructive Avocational Interests of Secondary School Boys*, p. 15. M. A. Thesis, on deposit in the Ohio State University Library, Columbus, 1931.

[4] Bonser, Frederick G. and Mossman, Lois C., *Industrial Arts for Elementary Schools*, p. 15. The Macmillan Company, New York City, 1923.

Education of recent years has been directed to a large extent toward efficient production; the present trend is toward efficient consumption. As purchasers and consumers we must build up the element of good taste backed by sound study of things to be purchased and consumed. Commonly purchased articles may be occasionally selected which lend themselves to this method of study in the school laboratory. Woods, metals, electrical appliances, printing materials, drawing for various purposes, homes, clothing, transportation, food, tools and machines, all are significant of content material or subject matter that may be drawn upon for the teaching of intelligent consumer *selection, testing, operation or use, maintenance, judging*, and the ultimate satisfaction accruing from ownership. It is these five points which constitute my understanding of the consumer's purpose. Impartial study of the facts, and the freedom to experiment, will lead pupils to draw significant conclusions regarding the social usefulness of some of our present forms of production and the distribution of goods. Commercial interests may exercise pressure upon the school and the teacher in this scientific approach to the life of a consumer. Such pressure may be avoided by the adoption of objective measures and a scientific attitude. The use of code names for products frequently assists in facilitating such study. The average pupil can be taught to resist the temptation to buy novelties or new types of goods until after he has sought the best technical advice available to him. It is becoming increasingly clear that the future citizen can do more and more to protect himself against excessive or unnecessary expenditures, and that he can thus materially increase his income. The consumer should look for the common points of superiority in evaluating his impending purchases. Too much of our purchasing is governed by the power and appeals of modern advertising. Recent writings on this and other subjects pertinent to the consumer are the works of Stuart Chase, F. J. Schlink, Paul Cherington, Henry Harap, and the bulletins issued by the Government Printing Office. Dr. Warner has particularly emphasized the consumer objective in his writings dealing with the Laboratory of Industries. Mr. DeWitt Hunt,[5] of Oklahoma, made a thorough study of the term "Consumers Knowledges" and its use as an industrial-arts objective in his master's thesis.

If our concept of education is that of a complete act, then the *selecting, testing, operation or use, maintenance*, and *judging ultimate satisfactions*, derived from industrial-arts projects completes the cycle. It would seem that the time is ripe to give the ultimate consumer a measuring device, or a method of evaluating what he uses.

The third objective deals with how to understand *common technical knowledge and abilities*. The making of a shop project is *only a means* in teaching. *Common* manipulative experiences are embraced, also certain knowledges and abilities. In each shop are found common technical knowledges which form basic teaching techniques. For instance, it would be folly to have a boy make up metal-cutting tools out of wrought iron when it is known that wrought iron cannot be tempered for metal cutting. When a boy is given a mild steel for these projects he is being taught some metallurgy — common technical knowledges! The ability to heat, manipulate, and form this mild steel into a center punch or a chisel is acquired through watching demonstrations and then by actual practice. Frank C. Moore of Cleveland, in coöperation with drawing instructors, has graphically analyzed the common technical knowledges in drawing necessary to acquiring technique. Some such graphic means of representing the occurrence of these common knowledges in any given shop is of inestimable value in teaching. The ability to perform standard operations can be checked in like manner. Such a procedure makes for consistent teaching, testing, and training. Studies made by Bobbitt, Fuller, Hopkins, Newkirk, Osburn, Selvidge, and others, give adequate lists of common technical knowledges, abilities, tools and materials for the industrial-arts teacher to check.

A fourth objective deals with how to understand *personal social trait development*. The industrial-arts department must of a necessity organize and operate on some particular plan or procedure to fulfill its purpose. Pupils in an industrial-arts laboratory learn to work together both as leaders and followers. What and how they produce is reflected in the smooth operation of their particular organization. Social intelligence is becoming more and more important for individual success in such schemes. Too often we find some of our finest secondary-school graduates becoming misfits and failures because they have not learned how to work with people. It is not necessary to stifle individuality, but rather, to offer opportunities to teach teamwork and lines of responsibility. The unit shop in industrial-arts developments is frequently giving way to more diversified settings with classes ranging in size from thirty and upward. There is a real problem and a real opportunity in shop organization and management. The shop teacher is foredoomed to failure unless he organizes and distributes his responsibilities in such a manner as to form his classes into coöperative units. No set rules pertain to such an organization, but we do have precedent established in industry and in the business world. The operation of a personnel organization permits the development of personal social traits in individual pupils. Objective means for selecting officers and personnel may be used, embracing the use of intelligence tests, mechanical-ability tests, and character and personality tests.

Profile charts[6] of various kinds, and other devices should be used by pupils to develop wholesome introspection and self-analysis. A continuous study of trait actions in the laboratory is of significance and should be made. Success or failure on the job is frequently determined by these social variables, and this, frequently, despite a high intelligence and mechanical-ability score. The personnel[7] organization afford a fine opportunity for the pupil to learn of such traits, for he is rewarded or punished in a friendly laboratory setting as they may develop, and should come out the better for it.

Summary

If there has been any technique in this discussion of how to understand industrial-arts objectives, it has dealt with trying to understand the various points which describe the nature of an objective. In any school-shop setting, the mention of the term "consumer" immediately calls to mind the five points of: selection, testing, operation or use, maintenance, and the judging of ultimate satisfactions accruing from ownership. Similarly the exploration objective, which has been omitted in this discussion, calls to mind five other principal points, which include: a study of the pupil, a study of occupations, experience in a wide range of manipulative experiences, the handling of many materials, and finally a study of social problems and adjustments. Still other objectives could have been included, were it not for the shortness of time allowed for this discussion. These would have embraced such important purposes as the esthetic or design side of shopwork, or, specific manipulative attainments to be achieved by individual adolescents, or, the guidance function of industrial-arts work, and lastly would surely have included an analysis of the specific vocational training possible in industrial-arts settings, particularly in the senior high school.

The source for the material presented in this article has been chosen largely from an analysis of industrial-arts objectives developed by graduate students in a seminar under the direction of Dr. William E. Warner, at Ohio State University, in the summer of 1932.

[5] Hunt, Dewitt T., *A Study of the Term "Consumers Knowledges" and Its Use as an Industrial-Arts Objective.* Master's Thesis on deposit in the Ohio State University Library, Columbus, 1931.

[6] *My Vocational Guidebook*, The Bruce Publishing Company, Milwaukee, Wisconsin.

[7] Warner, William E. and Others, *Organizing Pupil Personnel in the Laboratory of Industries*, issued from the Department of Practical Arts and Vocational Education, The Ohio State University, Columbus, 1930.

Operating on a Reduced Budget

Ross C. Cramlet
Des Moines, Iowa, and
William L. Hunter
Iowa State College, Ames, Iowa

Economy in the school shop must be the watchword now more than ever. The list set up by the authors may be used as a convenient check by the shop instructor in ascertaining whether he is doing all he can to reduce the budget sanely during the present economic upheaval.

NEARLY all industrial-arts teachers have had their budgets cut for the coming year and now that the cost of materials, supplies, equipment, and labor are going up, there will be a real need to exercise every imaginable ingenuity in order to get through the year and still do the school-shop work effectively. Many of the suggestions for economy, which are listed herewith, have come from fellow teachers; however, a large share of them have occurred to and have been put into effect by the writers in their own work because of the existing necessity of working with constantly increasing numbers of students but with ever-decreasing available funds. There is no wish to contend that all of the economy measures are compatible, feasible, or even conducive to best educational results; however, the good wisdom of experienced industrial-arts teachers will guide them in their use of the suggestions.

Suggestions for Securing Economy

1. Sort all scrap stock and design a problem to use the small pieces.
2. Emphasize economy in the use of glue, screws, nails, dowels, rivets, hack-saw blades, etc. When possible, issue only exact amounts of materials or supplies needed.
3. Buy lumber in odd lengths and widths at a reduced cost per foot.
4. Make your own items of equipment for such things as tables, cases, stands, etc.
5. Save partially used sandpaper and have it used until it is worn out.
6. Use less costly methods of wood finishing; paint rather than lacquer, wax rather than varnish, etc.
7. Use shop problems which require less material or which involve a larger number of tool processes.
8. Charge against other departments the materials and supplies used by them; stage scenery for dramatics department, for instance. Establish in the minds of fellow teachers, janitors, and others the idea that all materials have value. One 5-cent article each day for 180 school days means $9 to the industrial-arts department.
9. Buy materials and supplies in large lots at reduced prices and at a lower unit cost of transportation.
10. See your local lumber dealer in regard to small lots of lumber not carried in stock by him. Sometimes these can be ordered shipped with a carload lot of lumber, thus eliminating a large share of the transportation cost.
11. Shop around and buy odd lots of lumber, etc., from farmers, junk dealers, secondhand stores, fire sales, and other sources.
12. Standardize shop problems and hand out necessary materials already cut to needed dimensions.
13. Carefully plan, organize, and provide for larger classes.
14. Arrange shop so that most-used equipment is nearest natural lighting, thus eliminating to some extent the need for artificial illumination.
15. Have pupils bring dry-goods boxes, furniture crating, fruit boxes, tin cans, and scrap materials for use in making shop problems.
16. Mix your own raw materials rather than buying those already prepared; filler, shellac, stain, and glue, for instance.
17. Devote more classtime to book-work, discussions, related information, careful planning of the problem, etc.
18. Arrange shop periods to be of the same length as academic periods, thus getting more boys in the class and reducing the per-pupil-hour cost.
19. Secure bids on materials, supplies, and equipment. Submit specifications to out-of-town bidders as well as to those in the city where the materials are to be used.
20. Buy direct from an original producer whenever expedient.
21. Use hektographed or mimeographed material so as to reduce the cost of printed and blue-printed materials.
22. Use wrapping paper for beginning pencil work in mechanical drawing, shop sketching, etc.
23. Use both sides of drawing paper.
24. Keep a record of special sizes of material used and purchase new orders accordingly.
25. Keep an accurate record of materials and supplies used for a certain class volume and thus purchase future orders in more nearly the proper amounts.
26. Buy adequate machinery and equipment but do not overequip. Other things considered, a machine or tool which does the job satisfactorily at the lowest cost per pupil hour is the one to buy.
27. Analyze the cost of each department or phase of the work and attempt to reorganize or eliminate those excessively expensive.
28. If much spoilage results to some part of a problem or project, redesign the problem so as to avoid the wastage.
29. Make a community analysis of the problems or projects receiving most use in the homes. Your work will receive public support in inverse ratio to the number of your shop problems found in attics.
30. Buy factory and mill cuttings; short lengths of band iron, small pieces of plywood, sheet-metal scraps, etc.
31. Use one electric motor for several purposes.
32. Use answer strips for tests, keeping the test blanks for use in succeeding classes.
33. Put a pilot light on the glue pot; thus saving glue, electricity, and burnt glue brushes (when thermostatic control is not provided).
34. Use cheaper paper for correspondence, records, etc.
35. Make paper cuttings from print-shop into scratch pads for use of pupils or teachers.
36. Where possible, secure educational discounts.
37. Fasten a small oil pot to the drill-

press stand and use a small brush, rather than an oil can, for lubricating drills. This saves both drills and oil.

38. True down the oilstones with carborundum grit rather than buying new stones.

39. Organize finishing processes in your shop so that a series of projects may be finished at one time. This will save materials and cleaning fluids.

40. Devote occasional periods to current events as they relate to industrial topics. It will stimulate interest in good mechanical magazines and will enable a boy to participate in and appreciate the value of wholesome and informal conversation.

41. Save mimeograph stencils, tracings, carbon paper and all materials which may be used again.

42. Use precaution in storing problems or projects in process of construction. This will avoid damage and keep down replacements.

43. Teach your pupils to be resourceful. It will increase the amount of materials they will provide for themselves.

44. Arrange containers for finish materials so that accidental wastage will not be likely to result.

45. Paint or otherwise mark school-shop tools. This will assist in avoiding loss.

46. If any tool, such as a rule or pliers, disappears frequently, require each boy to furnish his own tool or else devise some means for preventing the loss.

47. Keep a record of tool breakage, determine causes if possible, and proceed in some manner to eliminate future breakage.

48. Note date of purchase of various brands of types of tools and determine usefulness over a period of years. Purchase future orders accordingly.

49. Purchase drawing paper, tracing cloth, etc., which will stand the most erasures.

50. Keep all reserve supplies locked.

51. Maintain a perpetual inventory in reserve stock and supply room or cabinet.

52. Design problems or projects so that they will cut without waste from available stock.

53. Use precaution in storing materials so as to avoid waste; lumber from warping, iron from rusting, etc.

54. Post a sheet giving prices of all supplies and materials used by the pupils. Require that the cost of every problem or project be computed before construction begins.

55. Buy salvaged equipment when the quality is standard and its condition is such as to render satisfactory service.

56. Require a completed project from a pupil, up to the stages of finishing, varnishing, etc., before he is permitted to begin another.

57. Insist that damaged or ruined pieces be presented to the instructor in order to get replacement parts.

58. Use discretion in permitting pupils to take their work home to work on during evenings. Some pupils spoil their work.

59. Have unfinished projects, due to student drop-outs, finished and sold.

60. Require an equal cash-value deposit for tools taken from the schoolroom by other than school officials.

61. Have a definite checking system for all tools and materials lent regardless of the person who borrows them.

62. Except for short periods of time, do not permit work in the shop unless the instructor is present. Even for short periods of time it is advisable to shut off large or dangerous machinery.

63. Instruct the janitor to let no unauthorized person enter the shop when the instructor is absent, without a written permission.

64. If a toolroom is used, do not have an outside window unless it is barred or heavily screened.

65. Mix glue and other materials in such quantities that they will be used with a minimum of waste.

66. Teach your pupils to keep their benches neat and orderly. This tends to prevent breakage, especially if there is a concrete floor in the shop.

67. At the beginning of the year allow no work until it has been properly directed.

68. Utilize the students as foremen, toolroom clerks, clean-up men, etc.

69. Keep a supply of fuses readily available so that in case an emergency arises dangerous alternatives will not be used.

70. Before permitting a pupil to use a machine, give thorough instruction in its use. This prevents unnecessary accidents and breakage.

71. If a toolroom clerk is used, have him issue all supplies and materials in accord with exact amounts needed for a certain problem or project.

72. Keep a "want book." You will make fewer orders, thus decreasing transportation and other routine office costs.

73. Use the oil can.

74. Clean out your electric motors once a year with compressed air or otherwise. This will reduce motor maintenance and rewinding costs.

75. Carefully inspect all material which is run over the jointer, through saws, etc.

76. Require that circular-saw blades, dado heads, etc., be hung up rather than left lying on tables, sawhorses, or elsewhere. This prevents damage.

77. Use an emery-wheel dresser occasionally. This helps to prevent "burned" tools.

78. Keep circular saws, band saws, and jointer knives sharp. This tends to eliminate spoiled material, keeps saws, etc., from being permanently damaged, and materially assists in keeping down the number of shop accidents.

79. Make and sell small projects, such as bird houses, flower trellises, flower boxes, etc. This provides an outlet for the work of indigent pupils.

80. Charge a small fee for breakage and replacements.

81. Make your own chisel handles, mallet heads, etc., as beginning exercises for wood-turning pupils.

82. Keep scrap boxes, old sandpaper boxes, etc., in more convenient location for the pupil than the regular supply. Thus they will use old material first because it is most handy.

83. Make ambroid glue of scrap celluloid and acetone.

84. Use a cheap grade of coal in the forge when no welding is to be done.

85. Do not permit the janitor or others to use the shop as a source for kindling wood.

86. In drawing, give each boy half a pencil and half an eraser.

87. Resharpen the glass-cutter wheel on a grinding wheel rather than buying a new glass cutter.

88. For instruction sheets, etc., use a typewriter with élite type, rather than pica type, thus cutting down stencil and paper costs.

89. Shear small pieces of band iron in vise, using a cold chisel and hammer rather than using a hack saw.

90. Have a gallon sediment can with a wire screen 2 in. from the bottom and filled with 3 in. of liquid for cleaning brushes.

91. Hang slip stones up by a chain, thus completely eliminating loss due to breakage.

92. Whenever possible, in assembling metal projects, use rivets rather than an acetylene torch.

93. Make your own hektograph board of 2 parts water, 1 part animal glue, and 1 part glycerine (by weight).

94. For drilling holes for wood screws use drills made from finishing nails.

95. For auger bits $\frac{3}{8}$ in. and smaller use dowel bits. These are much shorter than regular auger bits and break less easily.

96. Refinish old furniture.

97. When expedient, use nails rather than screws.

98. Place more emphasis on free-hand sketching and blue-print reading.

99. Eliminate the more expensive woods in favor of the cheaper kinds.

100. Paint walls of shop a light color, thus increasing the effectiveness of natural illumination.

101. Utilize the back side of old mimeographed paper for paper pads, scratch paper, etc.

102. During vacations lock up all perishable or easily damaged tools, equipment, or other items; grinding wheels and paint brushes, as instances.

Conservatism vs. Extremism

Towne R. Abercrombie

Washington Junior High School,
Cincinnati, Ohio

An earnest plea for all interested in industrial arts to raise it from a special subject to an integral part of education as a whole.

IN THE field of industrial arts today we are quite likely to find at least two divergent attitudes expressed in actual practice. To say that these attitudes correspond in their entirety with the mental concepts of the subjects on the part of those intrusted with the furtherance and development of the subject matter within the field would be a far-reaching statement and difficult to prove. The entire industrial-arts field is facing an emergency, as is practically every phase of the educational curriculum. We are constantly called upon to defend our program, as well as prove conclusively that our particular phase of education is not a "frill and a fad" that might be eliminated as an economic measure. This factor alone may have considerable influence in the establishment of the divergent attitudes.

Conservatism may be defined as being opposed to progress, and *extremism*, as being an advocate of very new, or very severe measures. For the purpose of this discussion, however, conservatism refers to that type of education which deals rather exclusively with appreciation in connection with the many branches of the industrial-arts curriculums, while extremism refers to the theory of production as a basis for the development of a course designed to convince the taxpaying public and administrators that this particlar phase of the educational system is entirely justified and must not be eliminated.

Somewhere between these two attitudes there must be found a middle point of desirable and effective educational practice. This does not mean that it is necessary to utilize a liberal dosage of conservatism and a like quantity of extremism as a basis for a middle point. It does mean that somewhere between the two attitudes is a point which will provide not a mere mechanical or superficial compromise between opposing attitudes, but a positive, constructive, scientifically grounded view of industrial education which will be conclusive proof in itself that the subject is not a "frill" or a "fad."

This middle point between the two attitudes must necessarily fit into the whole scope of the educational field. Too long have the industrial-arts subjects, as well as various other phases of education, been relegated to the "special" or "incidental" class. They were evidently not quite acceptable as a definite part of the curriculum, and, therefore, were included under the category of special subjects. It is gratifying to note a gradual decline of this sentiment in parts of the country where the taxpaying public are convinced of the value of the industrial-education program as a part of the whole scheme of general education.

To entirely eliminate the industrial arts from the "special" field, it is necessary that the subject be made to transcend the so-called special field and become an integral part of the whole curriculum. To bring about such an integration of the various phases of the industrial-arts field with the other activities of the curriculum requires a very complete understanding of the general philosophy of education on the part of those individuals directly responsible for the success and continuance of industrial education.

As previously stated, the sentiment which has kept the industrial arts in the "special" field has somewhat declined and the various phases of this particular field have been integrated with the whole. This integration with the other subjects of the school curriculum has been sound, insofar as it has reflected the natural relationship which similar materials have in life situations and has recognized the important factor that industrial-arts subjects have a broadening influence by reason of the general information and abilities which may be developed by a working and intelligent knowledge of processes, of relationships, of raw and finished materials, of practices and principles underlying industrial practices, of scientific principles, and a host of other factors which might come within the category of conservatism as defined for the purpose of this article. The integration has also been sound in that it has recognized the fact that pupils may better understand certain processes and materials by actually working with those materials and by developing a certain degree of skill in manipulation of tools, machines, etc. In other words, by becoming familiar with industrial practice; but this contact need not and should not be carried to the point advocated by extremism as defined heretofore. In short, the *strictly* vocational atmosphere must be avoided.

The mere fact that the vocational atmosphere on the one hand, and the strictly theoretical atmosphere on the other, have been and still are employed, has been one of the detrimental factors to an integration program. *It is only when the middle point has been reached that complete integration will become an actuality.*

If the foregoing statement may be accepted as a fact, those individuals directly responsible for the industrial-arts program must understand, as well as apply, the theories and practices of accepted educational philosophy. If the subject be accepted as a part of the general philosophy of education there will be no great need of a defense attitude on the part of teachers and administrators. As now organized in far

too many schools, there is ample justification for the elimination of the subject as a nonessential from the layman's point of view.

We, in the teaching profession, have our own answer to questions relative to the importance and value of the subjects in our school curriculum. Our answers, however, are not always conclusive to the layman who must be convinced of the value of any course. Shops, laboratories, even entire school systems will not be maintained upon indorsements of teachers, especially at the present time when all matters pertaining to education are so critically scanned.

Quite recently a large number of public-spirited citizens were requested to make an analytical statement as to the value of the public schools, or "Are the public schools worth what they cost?" This symposium appeared in a recent issue of *Ohio Schools* and is well worth serious deliberation. One statement, in part, reads as follows:[1] "Public or private schools are worth what they cost *only insofar as their courses fit pupils for practical work in life.*" The emphasis on the latter portion of the above statement is not given in the symposium but is here utilized for a specific purpose.

This statement should be encouraging to the industrial-arts proponent, especially to the advocate of extremism, for is it not his ultimate purpose to train his pupils for "practical" work? However, let us continue with the statement.

"To teach manual training, or science, or botany. or other nonessentials to boys or girls who have their way to make in the world and who can and will make no practical use of them . . . this is a gross waste of taxpayers' money. It also takes up time which could far better be spent on such subjects as will have active bearing on the pupil's future." A forceful, pungent answer to the query. An answer which may be analyzed in several ways and different interpretations arrived at after each analysis. It contains food for thought on the part of those interested in educational programs.

Does this answer favor the conservative or the extremist? " . . . to teach the subject to boys and girls who have their own way to make in the world and who *can* and *will* make no practical use of them is a gross waste of taxpayer's money." What an argument this statement may bring forth. Is it possible for any boy or girl to pursue a course in industrial arts, household arts, commercial work, or what not, and not gain something of value, or make some practical use of the information thus gained? It would seem not. Perhaps Mr. Terhune intends to imply that such subjects as he has mentioned, especially manual training, when taught to pupils preparing for lifework in a profession such as surgery, for example, might be a gross waste. But would it? It may be a far cry from the sloyd knife to the surgeon's scalpel, yet there may be a certain stance developed, a certain sense of touch formed in dealing with the inanimate which could carry over onto the manipulation of instruments when working with animate. Studies have been made on several occasions to ascertain whether there is a carryover, or transfer of information. Results of these studies and tests do not seem to show that there is.

In Cincinnati, tests were made over a period of time in an attempt to prove that pupils taking a printing course were better spellers than those not taking the course. It seems feasible that the boy in constant contact with words should be a better speller than his schoolmates, yet it was found that there was no apparent difference. The mere fact that the printer worked with words in a mechanical way did not seemingly influence his ability to spell words correctly. Certainly there seems no better opportunity to train boys in the correct spelling of words than through a printing course, but it does not seem to do so. Admitting the lack of transfer, could we say that offering the course to individuals not planning to become printers would be a "gross waste"? Hardly.

Many arguments could be raised over the statements made. It is not, however, the purpose of this discussion to "start an argument." The purpose is to foster, if possible, a train of thought which may ultimately lead to the middle point, the point of desirable educational practice in an integrated school program. Not by development of something "brand-new," not by cloaking the old with new names, but by careful, thoughtful study. One more quotation from the same author as follows: "Certain improvements in public-school education have been made during the past half century. But, in my opinion and in my experience they are hopelessly outbalanced by the nonessentials wherewith pupils' brains are stuffed. I do not expect educators to agree with me in these beliefs — but what I say is true."

Who can say how many hold the same point of view? What will the laymen say, whose duty it is to support the schools of tomorrow? A serious question. the answer to which lies in the hands of teachers of today. Nonessentials must go. Will industrial arts be considered as a nonessential in tomorrow's program, or will it be a unit in an integrated school program. Conservatism will never put the subjects in the curriculum as an integral part of the whole. Extremism likewise will fail if used alone. *The middle course must be found.*

There is handwriting on the wall in educational circles. Recently a state superintendent of public instruction stated that his state would dispense with the services of 4,000 teachers this spring as an economy measure. Such a wholesale discharging of teachers and discarding of equipment is unfortunate and may easily lead to the scuttling of the schools as an "economy measure." It is making the education of youth fluctuate with the stock market.

To summarize, neither conservatism nor extremism will suffice. A philosophy must be developed which will

[1]Albert Payson Terhune.

integrate industrial arts with the whole philosophy of education. Establishment of certain standards are worth while but that alone will be insufficient. Development of skills is likewise insufficient. There is a great field for local, state, and national organization effort to find the desirable middle course in the field of industrial arts which will merge it into education as a whole, not as one of the so-called "special" subjects, but as a vital and important part of the curriculum.

Using Linoleum Blocks

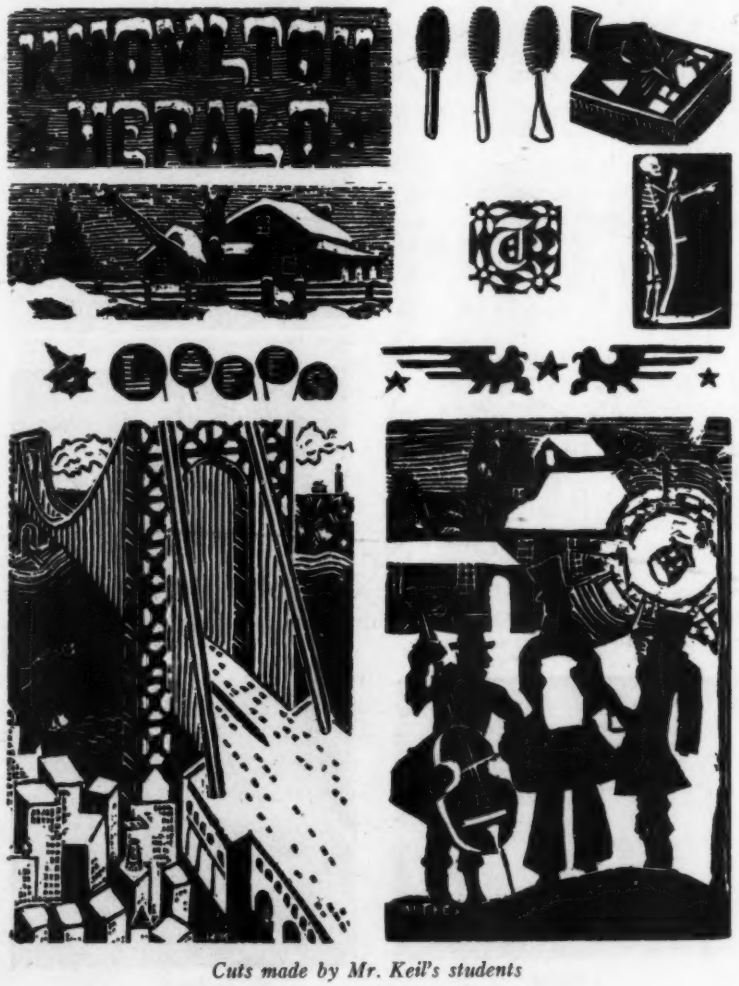
Aaron Keil

Knowlton Junior High School,
Bronx, New York

The author shows how, with a little encouragement, boys will respond and achieve worth-while and frequently astonishing results.

A GROUP of students requested the resumption of the school journal known as the *Knowlton Herald,* which had been suspended quite a while before. After some discussion it was decided to revive this school publication and the writer was assigned as faculty adviser. In order to reduce costs and at the same time produce a worth-while project, it was decided that all illustrations to be used in the publication would be linoleum blocks cut by the students. This meant that the publication would be practically a 100-per-cent student production.

After discussing the pros and cons of this proposition with the students, a small group of them reported for artwork. The process of cutting linoleum blocks was explained. A demonstration was given, and then the students made their first attempts on waste pieces of linoleum. Soon some of the specimens began to show signs of improvement. As the blocks were finished, they were taken to the school printshop and proofs were taken. These were studied eagerly, and defects remedied. As fast as a student completed a satisfactory block, he was asked to try his skill on a larger one.



Cuts made by Mr. Keil's students

Our publications needed ornaments for the tops of the pages measuring about 5 by 1, departmental headings measuring 5 by 1¼, and other illustrations of various sizes. Soon there were students who had acquired sufficient technique to warrant an attempt at full-page illustrations. When the first issue of the 40-page periodical was ready for the press, the students had cut 67 blocks which possessed sufficient merit to be used in actual production. Some of the linoleum-block attempts were quite daring. One of the students indicated a wish to write on the significance of the newly completed Hudson River bridge. Immediately one of the group of the linoleum-block cutters offered to cut an illustration that could be used with the article. Together they went to the student's home who was to write the article. Here, perched on the roof overlooking the tremendous bridge, viewing the automobiles

hurtling across the steel span, and the boats churning up and down the river, these two students tried to translate the scene into words and picture. How well some of these young artists succeeded in improving their work may be seen from the accompanying illustration.

Linoleum-block cutting is excellent for the junior-high-school student. He welcomes self-expression and linoleum-block cutting offers him a real opportunity. The technique is comparatively easy and it attracts the restive, impatient adolescent. In many cases the very first attempts by the student are creditable enough so that they may be used in illustrating an article. Furthermore, linoleum-block cutting gives a wide circle of participants an opportunity to do their share. Many students who would otherwise be among the spectators become active participators.

Linoleum-block cutting need not be made an end in itself. The student may be tempted to try linoleum-block cutting because he sees a purpose to it. He may want to make use of his skill in cutting Christmas, New Year, and Easter greeting cards and calendars. In the meantime, however, the teacher has been using this awakened interest to secure better technique, better observation of details, a better appreciation of art. The student, on the other hand, begins to recognize the limitations inherent in the tools and the materials which he is using and so may be tempted to other and more difficult branches of artistic self-expression.

Electrotyping

R. Randolph Karch

Arsenal Junior High School,
Pittsburgh, Pennsylvania

A well-illustrated, descriptive article about the subject of electrotyping. A fine related-subjects lesson for the printer.

The following is an illustrated lesson presenting information relative to electrotyping.

Fig. 1

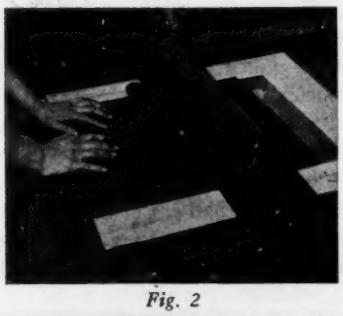


Fig. 2

Fig. 3

Duplicate printing plates may be made by either the electrotyping or the stereotyping processes. Duplicate plates are needed for the following reasons:

1. To save the original form or engraving from wear.
2. To save wear on new and delicate type faces.
3. To print in gangs (many forms on the same sheet, after which the sheet is cut to the required sizes).
4. To allow the same piece of composition to be printed at the same time in many different places.

Electrotypes are made by the following process:

The first step is to pour a thin coating of wax on to a metal plate lying on a heated table. This is shown in Figure 1.

After the wax has cooled, it is shaved off, as shown in Figure 2, until it is as smooth as glass. Then graphite is dusted over it to keep the form from sticking when being "molded."

The type form or printing plate to be duplicated is locked up in a chase, and graphited. It is then placed on the wax plate and pressed or "molded" into the wax. This is shown in Figure 3.

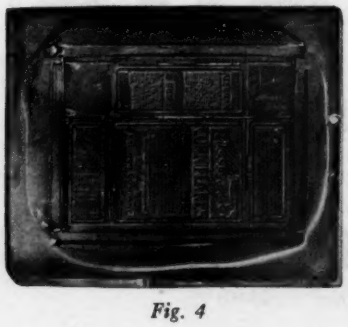


Fig. 4

After the wax has "set" under the terrific pressure of 3,000 tons it is known as a "mold."

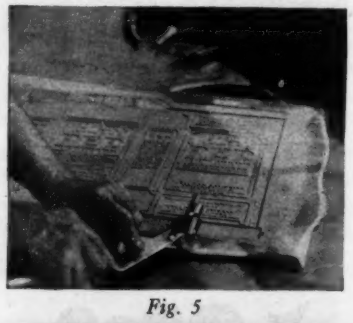


Fig. 5

Fig. 6

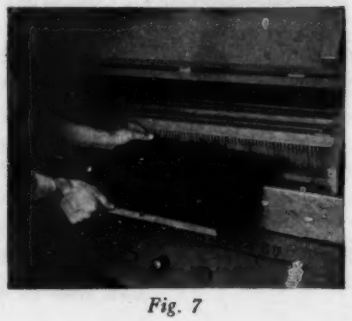


Fig. 7

Fig. 8

Fig. 9

Fig. 10

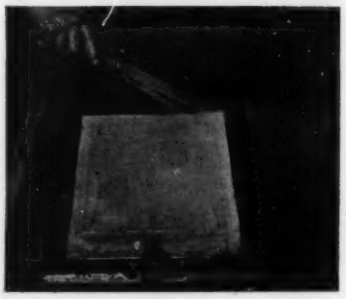


Fig. 11

Fig. 12

Figure 5 shows how the molder, with a knife, shaves off all the uneven edges and cuts the mold to a uniform height.

Next, all the open spaces (or "white space") are raised or "built up" by hand with wax, to insure a clean printing surface. Figure 6 shows how this is done.

The surface of the mold is then given either a thin polished coat of dry graphite, as shown in Figure 7, or it is coated with wet graphite in a tanklike machine, such as is shown in Figure 8.

The graphited plate is then washed, and the parts that are not to be electrotyped are "stopped out" with wax.

After the mold has been inspected, an electrical connection is made to the graphited mold, as shown in Figure 10.

A coating of copper sulphate is then sprayed over the mold, as shown in Figure 11, in order to speed up the electrotyping.

The mold is then ready to be placed into the electroplating bath, where a coating of copper is deposited on the graphited surfaces.

The copper-plating tanks, which are shown in Figure 13, are equipped with scientific controls to insure a uniformity of the product.

For the lead-mold electrotype shown in Figure 14, a thin sheet of lead is shaped to the form by hydraulic pressure.

The plating process in the tank shown in Figure 15, gives the lead-mold electrotype a printing surface of pure, hard nickel.

Figure 16 shows the workman removing the molds from the tank after the plating process is finished.

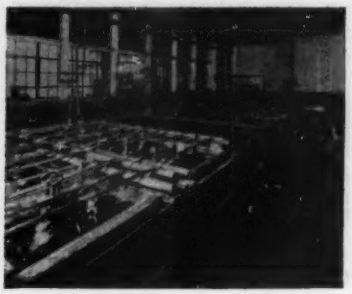


Fig. 13

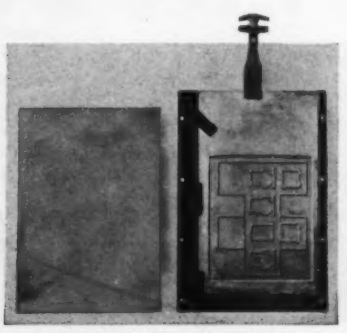


Fig. 14

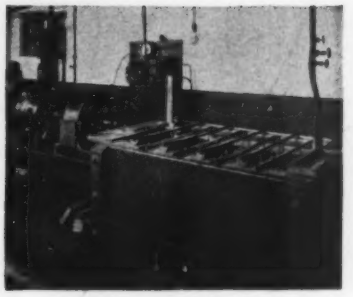


Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 19

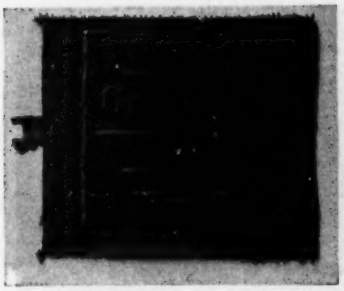


Fig. 20

Fig. 21

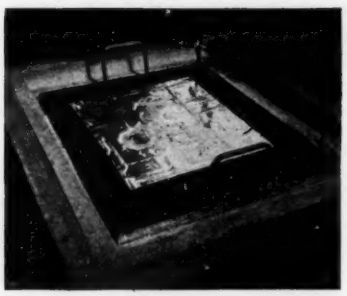


Fig. 22

Fig. 23

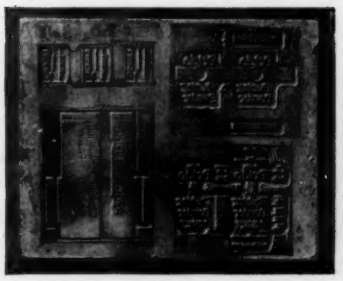


Fig. 24

The next step, shown in Figure 17, is to remove the "shell," or plated surface, by either melting off the wax, or peeling off the lead sheet.

Duplicates may be made by peeling off the wax (see Fig. 18) rather than melting it off.

The shell shown in Figure 19 is a thin sheet of metal with a face that exactly duplicates the original form of engraving.

The back of the shell, as shown in Figure 20, shows the effect secured in printing.

The shell is next cleaned, and the back brushed with a soldering solution. It is then covered with tin foil, as shown in Figure 21.

The shell is now heated very gently, and this causes the tin foil to solder itself to the back of the sheet.

Molten casting metal is then poured into the back of the shell, and this fuses itself to the tin foil.

The casting metal is then allowed to cool. The result is the plate, or "cast." This is about 3/8 in. thick (see Fig. 24).

Figure 25 shows the scrubbing machine in which the cast is next thoroughly cleaned with boiling water and live steam.

Usually more than one electro is cast at one time. Figure 26 illustrates the process of cutting them apart.

Figure 27 shows how warped plates are pressed flat, after which the back is planed to the final thickness.

The finishing operation consists of correcting all other defects by hand. This process is illustrated in Figure 28.

The back of the plate is shaved again and again, on the machine shown in

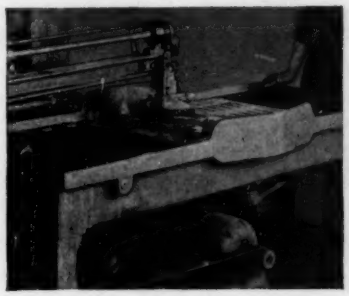


Fig. 25

Fig. 26

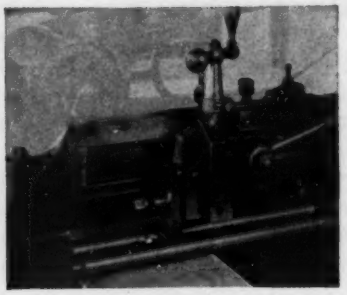


Fig. 27

Fig. 28

Fig. 29

Fig. 30

Fig. 31

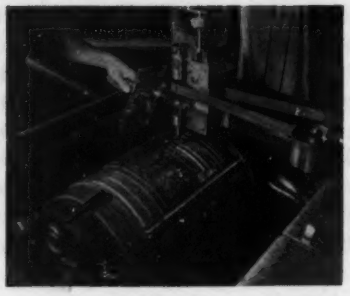


Fig. 32

Fig. 37

Fig. 38

Fig. 33

Fig. 34

Fig. 35

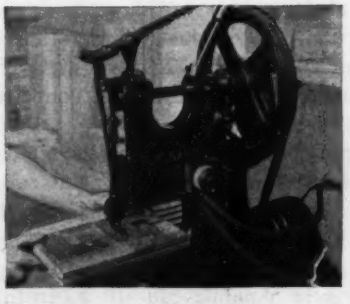


Fig. 36

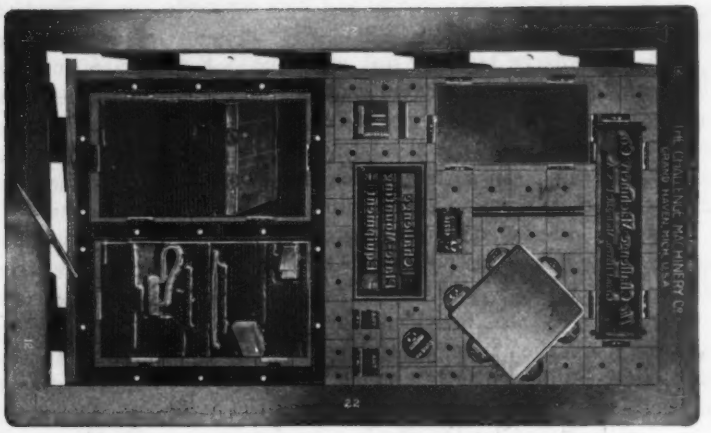


Fig. 39. Plates mounted on patent base, and the base locked in a chase, ready for the press

Figure 29, until the exact thickness is obtained.

The high metal on parts not printed is removed on the routing machine, as shown in Figure 30.

Electrotypes intended to be used on rotary presses are curved to fit the cylinders on the machine shown in Figure 31.

Figure 32 shows how the "dead metal," or the high part of the curved electrotype that is not intended to print, is routed out.

After the routing has been finished, the sides of the plate are trimmed down, as shown in Figure 33.

The electrotypes that are to be mounted on patent bases, are beveled on the special machine shown in Figure 34.

Figure 35 shows the machine for cutting holes into those plates which must be "mortised" for the addition of type matter.

If the plate is to be mounted on wood, the special nailing machine (Fig. 36) may be used.

After being mounted on wood, the bottom is planed "type high" on the special planer shown in Figure 37.

Figure 38 shows a special proof press upon which proofs are pulled while the plate is being finished.

Corrections. Bad type forms, which have corner breaks, low type, etc., can be corrected in the plate by the electrotyper. In having a plate made for several colors, there is no need for the compositor to set each color separately. The electrotyper makes a plate of the whole for each color, and then merely routes out from each plate all but the color wanted.

Nickel-steel electrotypes are made with a coating of nickel steel. These plates are more durable than the copper electrotypes, and also withstand the destroying action of certain colored inks.

Mounting Plates. A modern method of mounting electrotype plates is in the use of "patent base," or blocks. Plates to be used on this base are planed to 11 points in thickness, beveled, and mounted as shown in Figure 39. The edges of the plates are held to the blocks by small hooks.

FIXING THE PLANER

R. Randolph Karch

If the planer in the printshop becomes rough and nicked on the bottom, take it to the woodworking shop and run it over the jointer several times, taking off a very fine cut each time. Or, if there is no jointer, wait until the paper-cutter knife becomes dull, and before changing for a new one clamp the planer, bottom foremost, on the cutter bed and trim a trifle off at each cut until the planing surface is as good as new.

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

The N. R. A. and the Shop Teacher

Right after President Roosevelt had affixed his signature to the National Recovery Act, he made this statement: "The law I have just signed was passed to put people back to work — to let them buy more of the products of farms and factories and start our business at a living rate again."

In these words he outlined just what the N.R.A. will mean to the teacher. It will not mean reduced working hours in the teaching profession. It will mean neither more nor less salary, at least not at the beginning, but it will mean a stabilization of the normal family, and therefore also the eventual stabilization of means for insuring continued progress in the entire field of education as was possible in the era prior to 1931 and 1932.

When the N.R.A. has revivified the commercial and industrial life of the nation, the average man can again think of other things than just supplying himself and his family with food, shelter, and clothing. The deadening fear produced by the absolute helplessness of millions of workers who are out of work, has permeated the entire structure of our civilization. It was this fear that induced the school boards of so many cities to cut education almost to the mere essentials. Just as soon, however, as the average man is again self-supporting, the school, too, will have its opportunity to regain the position it held prior to this mad scramble for economy at any cost.

In the meantime, however, educators are confronted by the duty and the opportunity of putting their house in order, of analyzing their work so that they have clearly in mind what their duty to the youth of America really is, of so developing and organizing their work that it can be given efficiently without any unnecessary lost motion. They must remember also to establish the objectives for all of their work so clearly that even those taxpayers, who cannot see beyond the dollar which they must contribute, can clearly differentiate between the essential educational work, and the trumped-up pork-barrel projects fostered by unscrupulous politicians.

Vocational Education and the Educator

In an article entitled "Vocational Training Assailed by Snedden; Educator Demands Nation-Wide Reforms," which appeared recently in the New York Sunday *Times*, we read the following: "Ascertaining that the educational policies of 'professional' educators were far inferior to those established by laymen, Professor Snedden urged the establishment of a limited number of full-time vocational schools for each of the 3,000 vocations now followed by the United States."

It is well for education that its leaders so modestly give credit to others rather than take it upon themselves. It is true, there are many laymen who are quite willing to tell educators just how schools should be run. They are not so likely to tell the lawyer, the doctor, or the dentist just what he should do and how he should conduct his business, but they do feel themselves competent to decide any educational (and, it may be added, theological) question that crops up.

The leaders from those industries which embrace the occupations entered by from 80 to 90 per cent of our young people, are especially cocksure in their statements about the mistakes that the school is making in training those who enter industry. These laymen who are so sure that they know how the young workers should be trained, seem to forget that in the emergency brought about by the world war, it took a schoolman, Charles R. Allen, to devise methods by which vacancies in the ranks of the semiskilled and skilled workers could be more quickly filled than the wisest industrial executive had ever thought possible.

It may be remembered that previous to the establishment of immigration restrictions, the big lay minds in industry were quite well satisfied to make use of all the trained workers that could be induced to come to this country from Europe so long as this help could be cheaply and easily procured. It did not seem improper to these industrial leaders to allow Europeans to fill the executive positions while American workmen were forced to take the lower positions, and to become mediocre mechanics for lack of training. As long as trained men could be obtained, Americans seemingly did not have to be trained, and it was only the exceptional man who could wrest from these employers and from his own unaided efforts sufficient training to become an expert himself. It is to these self-made men that the credit for America's industrial supremacy, belongs, and not to industry, or to the industrial leaders as a whole.

Of course, there were at all times American firms who took the training of their workmen quite seriously and who inaugurated exceptionally good training systems. However, the majority of the industrial firms were well satisfied to fall back upon the platitude that they employed none but experienced help. As a matter of fact, the slovenly, not to say dishonest, way in which trades were taught by industry under the apprenticeship system 20 and 30 years ago, were the cause of that system falling into disrepute, both with employers and employees.

Just as it was true 20 years ago, so it is true today that some industrial concerns have wonderful training programs, but it must not be forgotten that the training which is given in any industrial plant prepares the student primarily for a definite position in that plant. Training in a public educational institu-

tion, however, cannot be so specific. The man working in the machine shop of a large manufacturing concern and the machinist employed in a railroad shop are both known as machinists in industry. Yet to the applicant for a job at the railroad shop, the mere fact that he has learned his trade in a certain manufacturing plant is not a very helpful recommendation, because before he becomes of any great use in the railroad shop, he must first acquire a number of special methods which are entirely unknown to the average journeyman machinist.

If we take agriculture as another instance, we must agree that it was not the farmer who brought about the improvement in methods which are now being used. It was rather the agricultural educator, who by dint of great expenditure of personal energy finally induced the individual farmer, even against his will, to try experiments which later developed into the newer agricultural methods now commonly accepted.

Progressive educators who have tried the experiment of independently approaching leaders in given professions and occupations for advice as to what is to be included in the educational work to be given trainees for the different positions, have learned that only the exceptional executive seems to have any definite idea of what is really wanted. A compilation of the suggestions contributed by the so-called leaders is usually so general that almost any course now offered by technical and vocational schools for a particular industry seems to more than fulfill all requirements.

It goes without saying that the educators who have developed vocational courses in the past have frequently erred, and that they have used faulty educational methods. All human progress seems to be based on the courageous initiation of a plan, and a careful and fearless attacking of problems as they arise. Industry, too, makes use of this same cut-and-try method. While the professional educator has his faults and has made his mistakes, the layman, and we mean especially the industrial leader, has no reason to be overly proud of the scrap heap produced by his misdirected efforts at making progress in his own, or in any other field.

Maintaining the Morale

With business and industry once more on the up-swing the shop teacher again can look forward to a hopeful future. This editorial, therefore, is not concerned so much with the maintenance of the morale of the teacher himself. There is need for the preserving of the class morale, however, and it is with the maintenance of this that the shop teacher must concern himself, especially at the beginning of the school year.

This is particularly true of the new teacher or of the teacher who is entering a new shop. There will be many occasions throughout the year when students will come to him with the assertion, "This is how Mr. So-and-So taught us to do it last year." It is at these times that the new teacher must be diplomatic and tactful. Not only must he instruct his students in the right methods, but he must do it without in the least disparaging anything that his predecessor may have done or said.

Prepare to be Prepared

Recently a teacher of industrial arts in a city in which that subject had been badly crippled by wholesale teacher dismissals, asked for material which he and his fellow teachers could use in their arguments for the reëstablishment in their city, of at least some of the industrial-arts work that had been abolished. The teachers involved were trying to make the taxpayer recognize the danger of dropping their subject from the curriculum and therefore were laboring strenuously to gather any available material that might be helpful to them in regaining their lost positions. Strangely, neither the man who was asking for the information, nor some of the teachers whom he was representing, were subscribers to any professional-teacher magazine.

Of course, these men are entitled to all the help possible, but they ought to realize that they themselves are somewhat to blame for the ills that have befallen them. During the years when they held their jobs they did very little to keep themselves informed as to what other teachers were doing. They were satisfied to do what they were told without actually worrying very much about the underlying principles which made their jobs necessary and possible. They took for granted that it was sufficient if their supervisor knew what it was all about, and they did not worry about the future of their subject. During the present era of enforced economy, they were weighed and found wanting — wanting in the very things which a few minutes of professional reading each day would have supplied.

No industrial-arts teacher, no matter what his success in his own classes, no matter what the size of the system in which he is employed, should feel that there is nothing further for him to learn. Efficiency is not always a concomitant of size. The large-city system may have to do things in a different manner from that followed in the smaller city, but real efficiency in the classroom depends upon how well the teacher knows his own work and how well he knows what others are doing. If he is satisfied with the methods which he has devised or which have been devised by a narrow circle of friends in a single city system, he may or may not possess the utmost efficiency of which he is capable, and he will never know unless he can compare his work with that of others. His professional magazine presents an opportunity of finding out what others are doing — an opportunity which he can't afford to overlook. Then, when the time comes to defend his subject, he will not have to go far to look for defense material, for he will need only refer to the back numbers of his magazines for the assistance necessary to present his story in a logical and constructive manner.

Handling Large Classes

Harold J. Van Westrienen

Director Vocational Education, Hamtramck Public Schools, Hamtramck, Michigan

(Continued from August)

Class Discussion and Generalization. When every member of the class has completed a lesson or unit of work, the class as a whole meets to discuss common problems and carry on a generalization under the direction of the teacher. At this time the teacher is able to contribute additional information and enrichment at a time that the students have acquired a background so that they are able to profit by this information. By building upon their low level but basic experiences the teacher is able to give the class the benefit of the more complex industrial processes and techniques. Without the preliminary experiences the student would be unable to fully comprehend. By drawing the attention of the student to better ways of doing things he will be increasingly more efficient after each succeeding generalization. Where the student is conscious of the process he grows in power to "profit by past experience." This seemingly inefficient procedure will appear wasteful to many teachers who prefer to "pour" knowledge into the heads of students by means of lectures and demonstrations presented before the need is apparent, but learning by doing and followed by reflective reasoning will be more permanent, and the student will grow in ability to consciously profit by experience.

The Place of Skill and Knowledge. The shifting of responsibility for appraisal to the student will, no doubt, be frowned upon by many who hold the view that the major purpose of any teaching should be the development of skills and the acquisition of knowledge. It was pointed out before that these are by-products of instruction, and soon lost through disuse. Students do not long retain skills and soon forget facts. It is, therefore, fair to assume that education which has for its major purpose the development of skill and knowledge, is not a very functional or valuable education. However, everyone will agree that there are certain basic skills and knowledge that are necessary and these have been provided for at the proper time. The point of view is taken that if students are stimulated to want to make something for which they have a need, they will be interested in making it as well as possible. It is also true that where students are given, and assume, the responsibility for grading their own work, they are even more critical than the average teacher. If these facts are true, it may be assumed that students will make every attempt to improve in any skill or to learn any facts which are preventing them from achieving a satisfactory product. During the period in which they are making an attempt to develop any specific skill this temporarily becomes a major purpose, but the skill will become only a means to an end, and not an end in itself, when it is once developed. This point has not always been fully appreciated by some teachers. If there are some students who are not motivated by high enough purposes, they can be held to reasonably high standards by insisting on their meeting the minimum standard for approved work as shown on the appraisal scale.

The Place of the Teacher During the Work Period. From the above description of the various phases of the class procedure it might be assumed that the teacher can sit back and watch the work go on, except during the period devoted to class discussion. No doubt, some teachers would be willing to use the lesson sheet as a sole substitute for the teacher, but this will not work out if proper results are to be obtained. There is no substitute for the teacher. The lesson sheet is intended only as a means of relieving the teacher of the more routine duties so that he will be able to devote his time more profitably to helping those who are in greatest need of help. These more important duties may come through a request for help from some student or may arise from a need observed by the teacher. The teacher will not be in a position to render this service while sitting behind the desk and "watching the show go on." He should spend the class time observing the students, detecting incorrect methods and helping them discover and correct their faults.

If the lesson sheets contain suggestions that the teacher be consulted for help, at strategic places, the student will in time feel free to request help when he sees a need for it. However, due to inexperience, the student will be unaware of many of his mistakes and limitations which can only be discovered if the teacher spends his time observing the students at work.

When a teacher observes a student doing a thing wrongly, or when a request for help is solicited, the teacher should question the boy so as to make him see his own difficulty rather than to tell him immediately how to proceed. In this way he will become more and more independent of the teacher in learning things for himself. It is most certainly the function of education to free the child and thereby make him grow in powers of vision, self-direction, self-appraisal, self-control, and generalization.

How to Provide for the Dangerous Machinery Problem. If students are not given preliminary demonstrations in the use of dangerous machinery, and are guided through instructions given in the supplementary sheets, there arises the question as to the problems of injury to the student and damage to the machine. This is a very important problem which requires a definite procedure if trouble is to be avoided.

1. Before the student is allowed to use a machine for the first time, he is required to conform to definite qualifying procedures. He should first be given a pretest covering the terminology, methods of operating.

and dangers involved in using the machine. For the information needed to answer the pretest he is referred to supplementary instruction sheets and textbooks. After completing the test he meets with a group of boys who are also qualifying for that machine and they discuss any points which are not clear.

2. When every point has been cleared up, they apply for a demonstration, which may be given by the teacher or some qualified student. This demonstration is effective since the student has already acquired a fairly clear knowledge of the important points and is in possession of the terms covering the names of parts and processes. It is also given at a time when the boy is ready to use the machine rather than from a few days to several weeks before he is ready for this information.

3. After the demonstration the new operator can demonstrate his ability to the teacher or another student as a final qualification for permission to use the machine. This procedure should result in better understanding, fewer injuries, and less damage to equipment than under the conventional procedure, with more time devoted to pupil activity and less of the teacher's time given to formal, inefficient demonstrations.

Handling Difficult Cases. There will be a few students in every class who are unable to conduct themselves properly with their new freedom. These boys should be isolated and denied the privilege of conferring with other boys, or exercising the other advantages until they have proved themselves capable. Unless this is done the class is liable to revert to a state of anarchy. If the majority of the class show these immature tendencies, it may be necessary to restrict the entire class and make it a privilege to join the small group who are capable of self-direction and self-control.

Providing for the More Able Students

In every class there are several students who possess more ability and initiative than the average. These students will complete the minimum requirements long before the majority of the group and must be given more of the same thing, or still better, the opportunity to do creative work. The average student is able to select his project, make a plan, follow directions, appraise his results, and take a minor part in the generalizations. He does not possess what may be called "creative ability," or the capacity to apply his newly acquired knowledge in new situations. This ability is comparatively rare and should be developed whenever present. The creative students may be roughly classified into two groups: (1) Those who can make applications where the ideas are supplied by the teacher, and (2) those who are capable of originating new ideas and working them out. The work of the first group may be considered of "B" level and that of the second group of "A" quality.

When these able students complete the required amount of work for a minimum "C" grade, they are given the opportunity to apply their newly acquired knowledge in some creative project. The project need not be confined to the subject matter, or field, in which they are working, but should be extended to any other subject field in which the child may have an interest or a special aptitude. It is the opinion of the author that every subject should provide the able child with opportunities to develop his special interests. The artistic student can express himself through a poster illustrating some point learned. Students interested in dramatics can write a play and coöperate with a group in presenting it before the class or the school assembly. Those interested in materials, machinery, or processes can be referred to reference material and submit a report of their worth-while findings.

In evaluating these special creative assignments, the matter of service and worth should be kept constantly in mind. It should be a definite requirement that every B or A assignment must be of definite value either to the student submitting it or to the group as a whole. This will develop in students the habit of not doing anything unless it is worth while. Doing a thing for its own sake has no place in the school any more than it has in life. A flagpole or a tree sitter may be doing something, but it is not worth while.

Miscellaneous

1. *Improving the Lesson Sheets.* It would be impossible to assume that the first lesson sheets would be perfect. It will be necessary to keep a record of all the questions asked by the students, and observe any ways in which the lesson sheets were not adequate, and change them accordingly. After a few rewritings they can be brought to a high state of perfection.

2. *Teaching Techniques.* The teacher who has been accustomed to small classes and has been in the habit of doing all the thinking for his students, will find it difficult to change his point of view and methods. This teacher will discover himself constantly reverting to old methods and find it necessary to reflect constantly on his procedure. It is very possible that the tendency to use teacher-directed methods will result in his being overburdened with details which will make it necessary to adjust his procedure. Careful attention will need to be given to the specific techniques used in stimulation, assistance, and guiding the generalizations. If this is not done the most valuable results of instruction will not be achieved and the results obtained from the large classes will be charged against them. Large classes cannot be handled successfully with the use of traditional methods, but this should not be accepted as a fault of the large class. These same improvements if used with small groups will result in better teaching and better results.

3. *Conclusions.* There is no doubt in the mind of the writer that many teachers will refuse to accept the policies and procedures outlined in this article. The space available is inadequate for clear description and the new methods cannot be adequately expressed in writing. Personal observation would be necessary for a full appreciation of the advantages stated. The matter of large classes, however, cannot be avoided while pres-

ent conditions continue. Having to accept the large class may force many teachers to search for solutions to their new problem, and this article is presented as one way in which they can be met. The pupil-directed, purposeful activity method of instruction is being successfully introduced in all of the classes in the Hamtramck public schools, and there is no reason why it will not prove equally successful in other school situations. This is not submitted as the best method, or the only manner in which large classes can be conducted, but is offered as one means of helping those in need of assistance.

4. *References:*

a) Policies and Techniques for the Writing of Lesson Sheets.

b) A Technique for the Use of Lesson Sheets.

c) Generalization or Helping Children Profit by Experience.

Published by Board of Education, Hamtramck, Michigan.

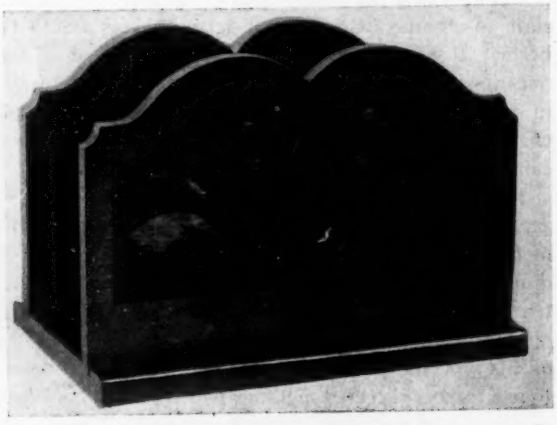
Problems and Projects

LETTER HOLDER

J. I. Sowers, Director of Prevocational and Adult Education, Miami, Florida

(See supplement No. 273)

The project described herewith is used in the early stages of seventh-grade woodwork. The project has the advantage of being very cheap, as it takes very little stock. Then too, it may be introduced early in the course before the pupil has quite mastered the art of squaring stock.



Letter holder with simple carving

The halftone shows a letter holder made according to one of the several optional shapes. Other designs are shown in the line drawing. This letter holder may be made of magnolia wood, but where this is not commonly used, poplar may be substituted.

The construction is so simple as to make further comments unnecessary. The decoration shown is outline carving with a scored background. It is the scoring of the background that makes this form of carving effective. The scoring is done with an ordinary carving V tool.

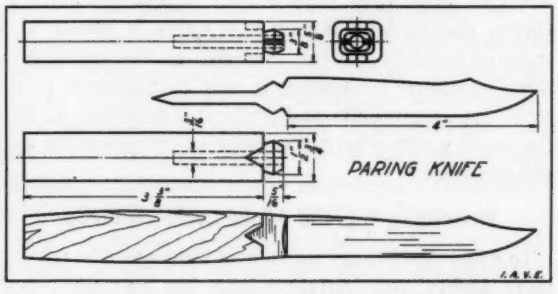
The finished job may be stained and given a shellac finish. The design may be highlighted by rubbing out the stain with fine steel wool. If the letter holder is to be used on a highly polished desk, the bottom of the finished project should be covered with felt.

A PARING KNIFE

Norman Brooks, High School, Greenville, Pennsylvania

The blade of the paring knife shown herewith, may be made from a hack-saw blade. A flexible-back hack-saw blade, however, will not do, because these blades do not contain enough tempered steel to make a good edge. The teeth should be ground off, after which this side of the blade is to be used for the back of the knife. While grinding the blade to shape, cool it often, so as not to draw its temper. All of the grinding should be done on the blade before it is set in the handle. The prong on the blade should be a little longer than the depth of the hole in the handle so that the prong may be driven in to hold more firmly.

In making the handle, drill the hole first. Trim down the rest to size and make the V cut in the handle, and then saw in the slot. Any design may be cut in the handle just so the babbitt will run into it and hold firmly.



Next, fasten the blade in the vise and then drive the handle onto the blade. Then wrap paper around the handle to the height to which the babbitt is to be poured. Then hold the knife in the vise and pour in the babbitt. It is much better to use babbitt rather than lead because the babbitt is much harder and therefore makes a better ferrule.

After the babbitt has cooled off, the handle and the ferrule should be filed to shape, and then the handle should be finished as desired.

A FLOOR LAMP

Jonathan Bright, Academy High School, Erie, Pennsylvania

The construction of the floor lamp shown in Figure 2 is very simple. After the pieces for the post are jointed and matched, the hole through the post is run on the dado saw, half of the hole being on one side of the center joint. This is shown at A in Figure 1, where two methods of construction are illustrated. The method used will depend upon the thickness of the wood available. Before turning, the hole is plugged for a distance of approximately 3 in. at each end, to give a solid bearing for the lathe centers. Unless a very

wide board of the proper thickness can be procured for the base, it will be necessary to glue several pieces together, as shown at B in Figure 1.

To eliminate the vibration or chatter due to the small diameter of the post, the jig or steady rest shown at C in Figure 1, has been found satisfactory and necessary. Its use is evident and requires no explanation. Care should be taken to have the centers of the hole in the steady rest in perfect

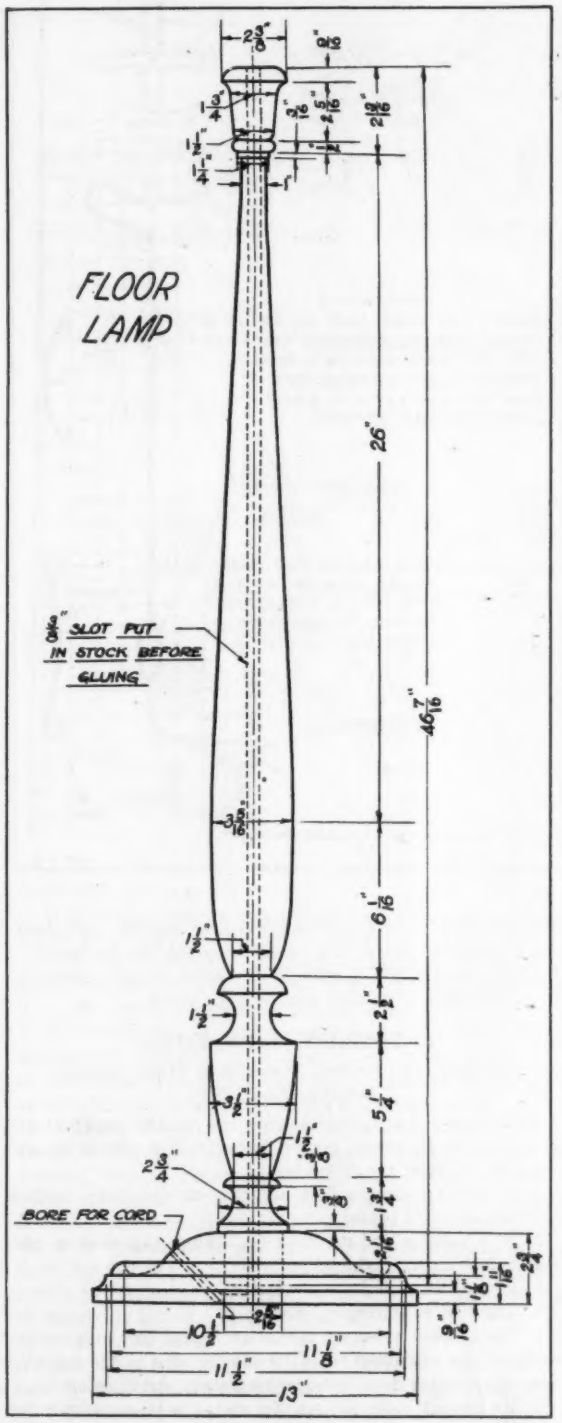


Fig. 2

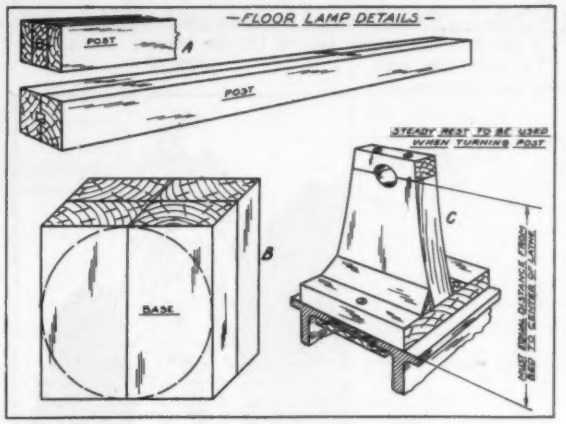


Fig. 1. Method of gluing up stock for floor lamp
The chimney iron doing active duty

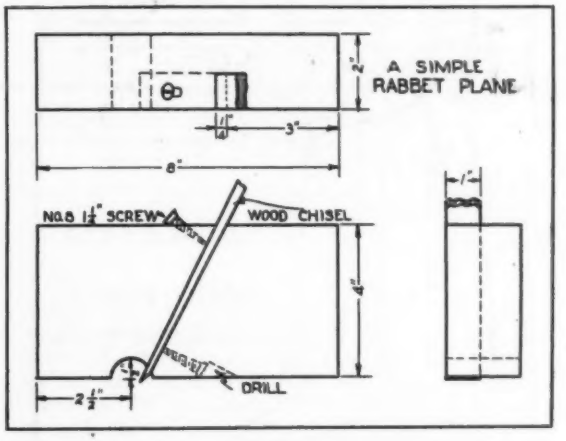
alignment with the lathe centers. The hole in the steady rest should be considerably larger than the finished diameter of the post, so that all of the oily wood can be turned off after the steady rest has served its purpose.

The finish is largely a matter of individual taste and preference. It depends upon where the lamp is to be used and the furniture it is to be used with. It can be made of gum, poplar, or birch, and stained with either mahogany or walnut stain and varnished.

HOMEMADE RABBET PLANE

Carl v. Lindeman, Paw Paw, Michigan

Quite often the manual-training instructor finds a need of a rabbet plane to complete a project. The one illustrated herewith shows a construction which is simple yet efficient. The body of the plane is made of maple or oak having a ½-in. circle cut 2½ in. from the end. A groove is next cut



out with a backsaw. It should be large enough to accommodate a ⅞-in. chisel. Two ¼-in. holes are bored to accommodate the screws, as shown in the drawing. The bottom of the plane is sanded smooth and rubbed with wax to make it slide easily.

A GOOD-NIGHT CANDLESTICK

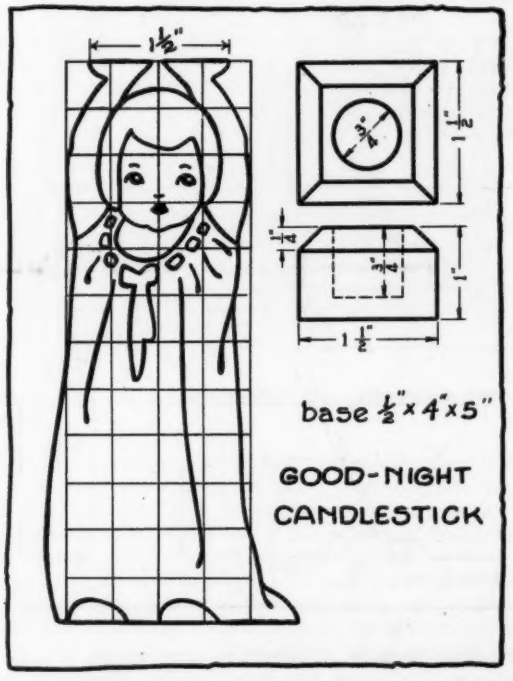
Hazel F. Showalter, Davenport, Nebraska

The good-night candlestick is made of three pieces: A base ½ by 4 by 5 in., with its upper edges chamfered to make a

neat finish; a shaped figure 6 in. high, cut from ½-in. material; and a candle-holder cup of the dimensions shown.

To make the pattern for the figure, draw on a piece of heavy paper a 2 by 6-in. rectangle, and divide it into ½-in. squares. Then draw the lines of the pattern through the squares as shown. Cut out the pattern and transfer it to the wood by marking around it. Then saw out the shape. In sanding this piece, round the edges slightly at the sides but true the ends sharply to fit against the other parts of the candlestick.

It will be well to bore the hole in the piece from which the candle holder will be made before cutting out the cup. This will prevent splitting. The base and the candle holder should have a ¼-in. chamfer around their upper edges to remove the crudeness of their plain forms.

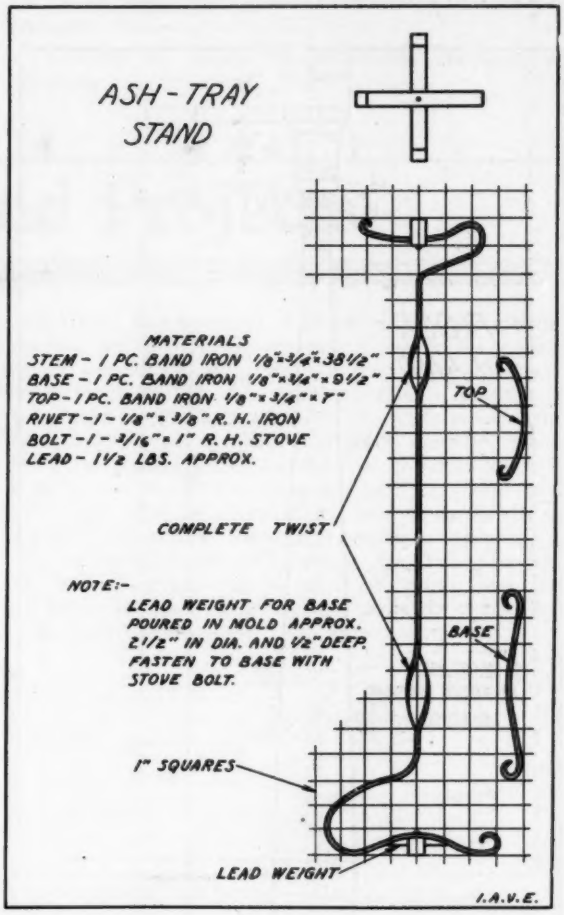


After fastening the three parts of the candlestick together with brads and glue, and having applied a ground coat, transfer the lines of the pattern to the figure with carbon paper. Then enamel the child's gown white, the ribbon and the slippers pink or blue, the face and the arms flesh color, and the hair suitable for a blonde child. Use brown for the eyebrows, the line about each eye, the nose, and the lines of the gown. Make the mouth red and make the eyes blue with a speck of white in each.

SIMPLE ASH TRAY

Ralph S. Smith, Irvington High School, Irvington, New York

The ash tray designed herewith may be made by beginners in wrought-iron work. Special tools and equipment are unnecessary and the sequence of operations together with desirable changes in design may be indicated by the instructor.


ASH-TRAY
STAND
MATERIALS
STEM - 1 PC. BAND IRON 1/8"×3/4"×38 1/2"
BASE - 1 PC. BAND IRON 1/8"×3/4"×9 1/2"
TOP - 1 PC. BAND IRON 1/8"×3/4"×7"
RIVET - 1 - 1/8"×3/8" R. H. IRON
BOLT - 1 - 3/16"×1" R. H. STOVE
LEAD - 1½ LBS. APPROX.
TOP
COMPLETE TWIST
NOTE:-
LEAD WEIGHT FOR BASE POURED IN MOLD APPROX. 2 1/2" IN DIA. AND ½" DEEP. FASTEN TO BASE WITH STOVE BOLT.
BASE
1" SQUARES
LEAD WEIGHT
I.A.V.E.

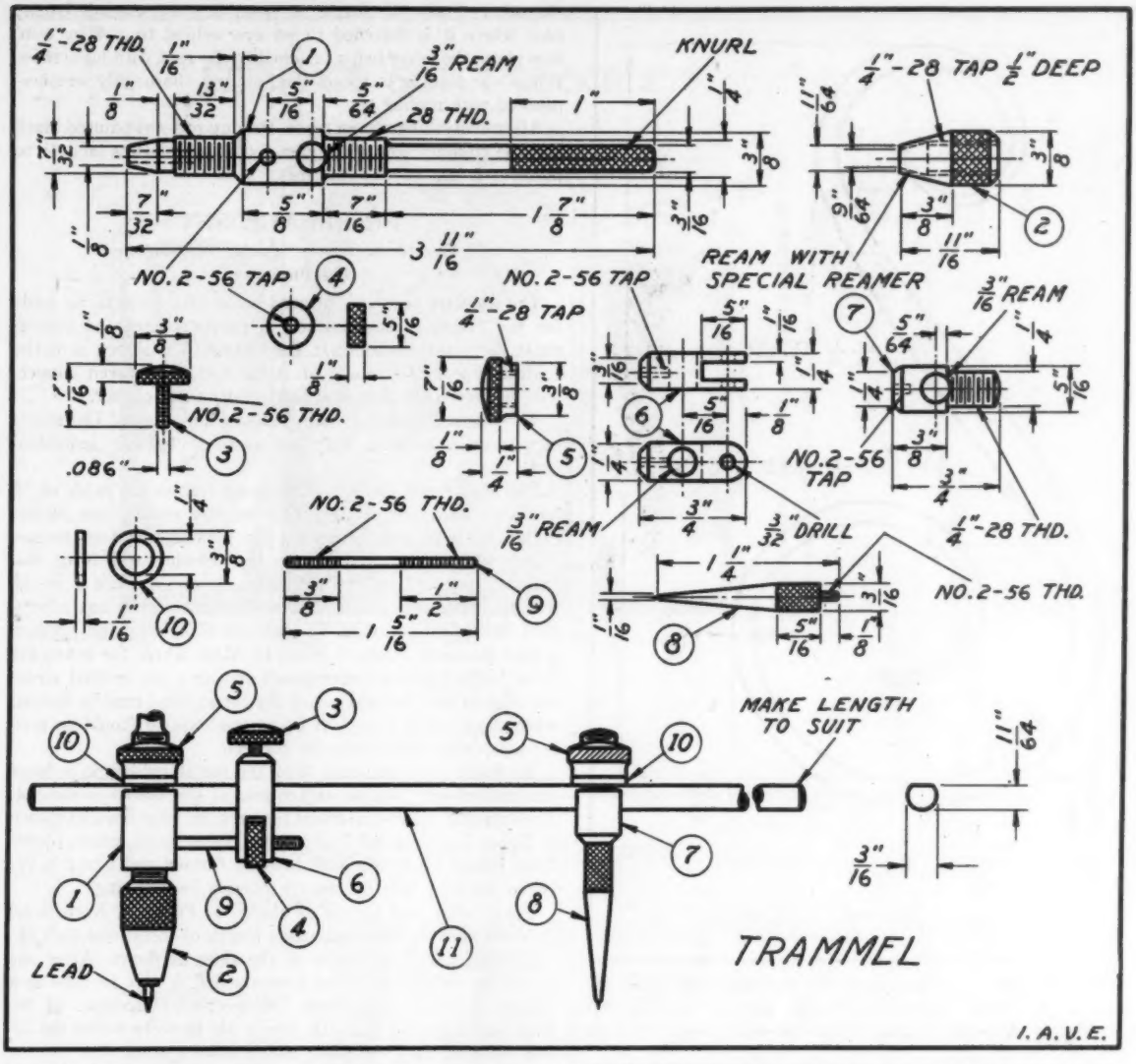
Black enamel with aluminum or bronze powder blown on in spots makes a suitable and pleasing finish.

A HANDY TRAMMEL

William E. Haynes, Vocational High School, Jamaica, New York

This project needs little explanation, as the drawings are quite explicit. However, certain features of it should be emphasized. It offers the following:

1. A medium for teaching accuracy on the lathe, milling machine, and drill press.
2. It is suitable and practical for schools that wish to emphasize instrument making.
3. Very little material is needed.
4. The cost is extremely small.
5. The project possesses utilitarian appeal for, with certain modifications explained below, it can be used in the machine shop, sheet-metal shop, woodworking shop, and drawing room.
6. No special tools are needed except a taper reamer for part No. 2. If need be, this tool can easily be made of drill rod or tool steel in the shop.



7. All of the above combine to make the job possess great motivation.

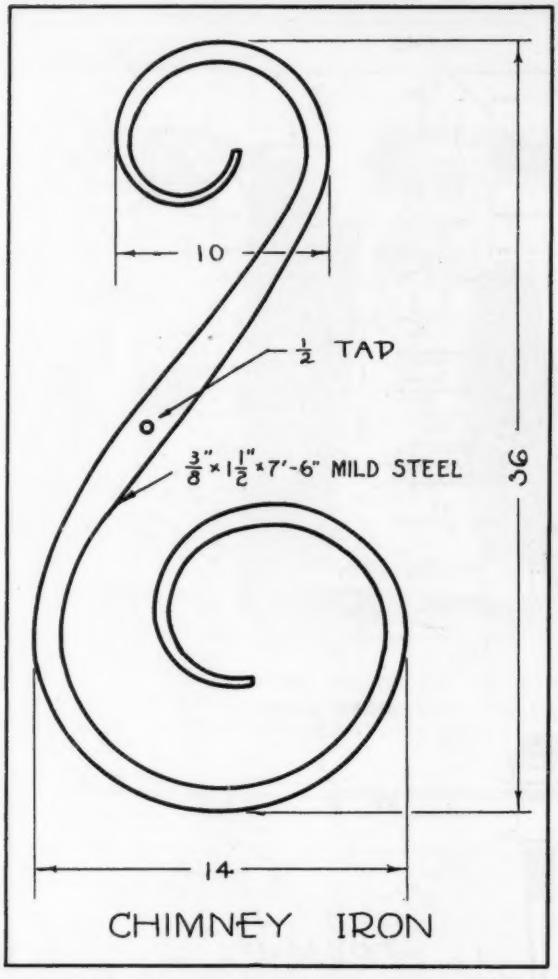
It is well to construct the entire tool from drill rod, especially parts Nos. 1, 2, and 11, which need spring, wearing quality, and stiffness respectively, although cold-rolled steel would answer in an emergency. If the thread on parts Nos. 7 and 8 is made the same as that on a ruling pen, ink curves may be drawn by substituting the pen for the shoulder point shown after substituting a steel needle point for the lead in the chuck. In a similar way scriber and ball points can be substituted for any of those shown in the illustration.

In regard to the actual machining, a word or two may not be amiss. Part No. 1 should be turned between centers, but the knurled diameter finished before the rest of the length is reduced in order to eliminate bending. Parts Nos. 1 and 7 should be drilled and reamed before the ¼-in. diameter that cuts into the 3/16-in. hole is turned. Rods of varying lengths may be made for part No. 11. If extremely long rods are needed, their ends may be turned down to 3/16-in. diameter while the rest of the rod is left of a larger diameter.

A CHIMNEY IRON

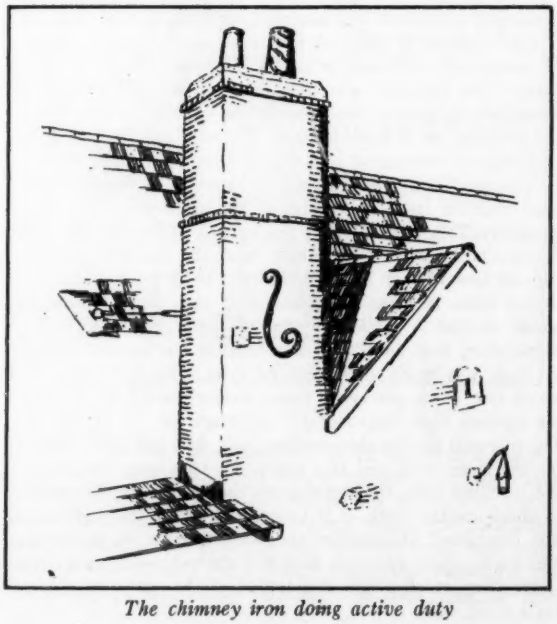
H. M. Andersen, J. Sterling Morton High School, Cicero, Illinois

One of the most interesting wrought-iron problems worked up in our shop was the chimney iron illustrated herewith. A full-sized layout of it was sketched on a blackboard, ruled off in 2-in. squares. A piece of iron wire was then bent around the outline of the sketch, so that a full-sized template was obtained. This template was then taken to the job and placed tentatively in various positions on the chimney until the correct position for it was obtained. The wire was then straightened out and measured, and it was found that mild steel ⅜ by 1½ by 7½ in. long, would be required to make the desired chimney iron. The center of the scroll was then determined from the sketch on the blackboard, after which its position was transferred to the metal. From this center a taper was laid out toward each end and the strip of metal was then machined down to these lines. The next step was to forge the metal, so that a section through its thickness at any place would show half an ellipse. For bending the scrolls, a scrolling fork was made of a piece of 1 by 2 by 4-in. iron, into which two ½-in. pieces of round iron extending 1 in. above the surface were fastened, 1½ in. apart on the center line The material for the chimney iron was then heated at the end for the large scroll and this was formed between the arms of the scrolling fork, the drawing on the blackboard being used to check up the work as it progressed. After the large scroll was completed, the smaller one was made in the same way. The entire piece was then filed and rubbed down with emery cloth, after which a hole was tapped in the center of the "S" for a ½-in. bolt.



An eyebolt was passed through the chimney upon which the chimney iron was threaded. Into the eye of the bolt was placed a swivel with a hook in one end and a toggle bolt on the other. From the toggle, a ½-in. guy rod extends to the roof where it is fastened to an eye welded to a 4 by 6-in. iron plate, the latter being fastened to the roof with lag screws. Where the plate is fastened, the roof was thoroughly weatherproofed with roofing tar.

After everything was in place, the guy rod was painted black and the chimney iron was given a coat of colorless lacquer to preserve it against the elements.



The chimney iron doing active duty

FIREPLACE SET

Gerald A. Boate, Seattle, Washington

The Firescreen

The fireplace screen illustrated is the fifth piece to be made for the fireplace set described in previous issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The screen is of the folding type and is made of strap steel, fine-woven copper-wire window screening, and light-gauge sheet copper.

The finished project is both pleasing and simple. The sheet-copper ornamentation may be modified to suit individual taste.

The End Panel Frames. The panel frames are made of ⅛ by ¾-in. band iron or steel. For the wing panels, four pieces, each 7 ft. long, will be needed for forming the four frames which when bent as shown in the drawing will form two matched pairs. The bending curve shown in Plate I is the natural curve which the bar stock assumes when heated and bent downward edgewise. The method of holding and bending is also shown in Figure 1, Plate II. Mark where the bends are to be formed with a center punch or with a file marked across the edge so that the position of the corner bend may be located when the metal is heated. A 24-in. steel square should be used for measuring and testing the corners.

To make a corner bend, heat the metal red-hot in a forge fire until about 5 in. on either side of the corner is red-hot. Then quickly clamp the metal between the vise-jaws, as shown in Figure 1, and pound it downward, using quick, gentle blows. Then reheat where the bend is being formed and clamp it between the vise jaws to remove bulging or crimping.

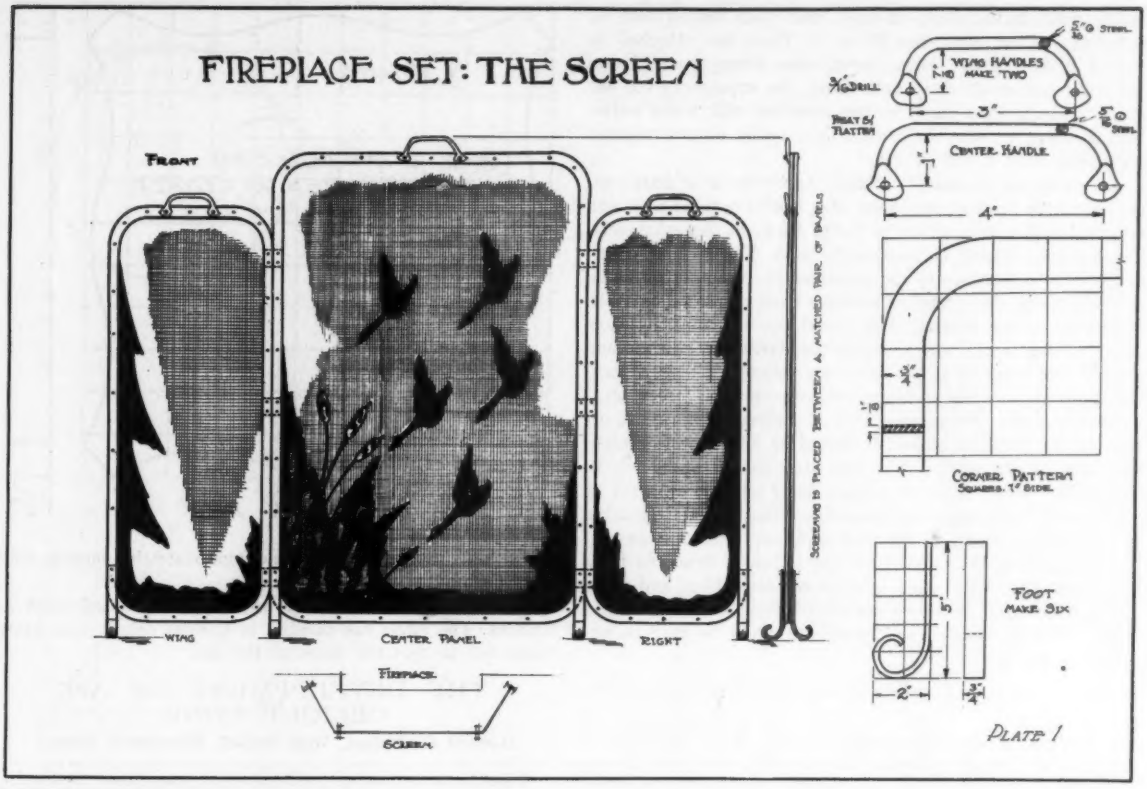
Check with steel square as shown in Figure 2. Each panel frame is made of one continuous length of metal, the ends being butted near the middle of the sides as shown. After one frame for an end panel has been formed, it may be used as a pattern for the other three. The over-all dimensions of the wing panels are 12 by 30 in. Use a file to score across the inside edges of the two frames which make a panel.

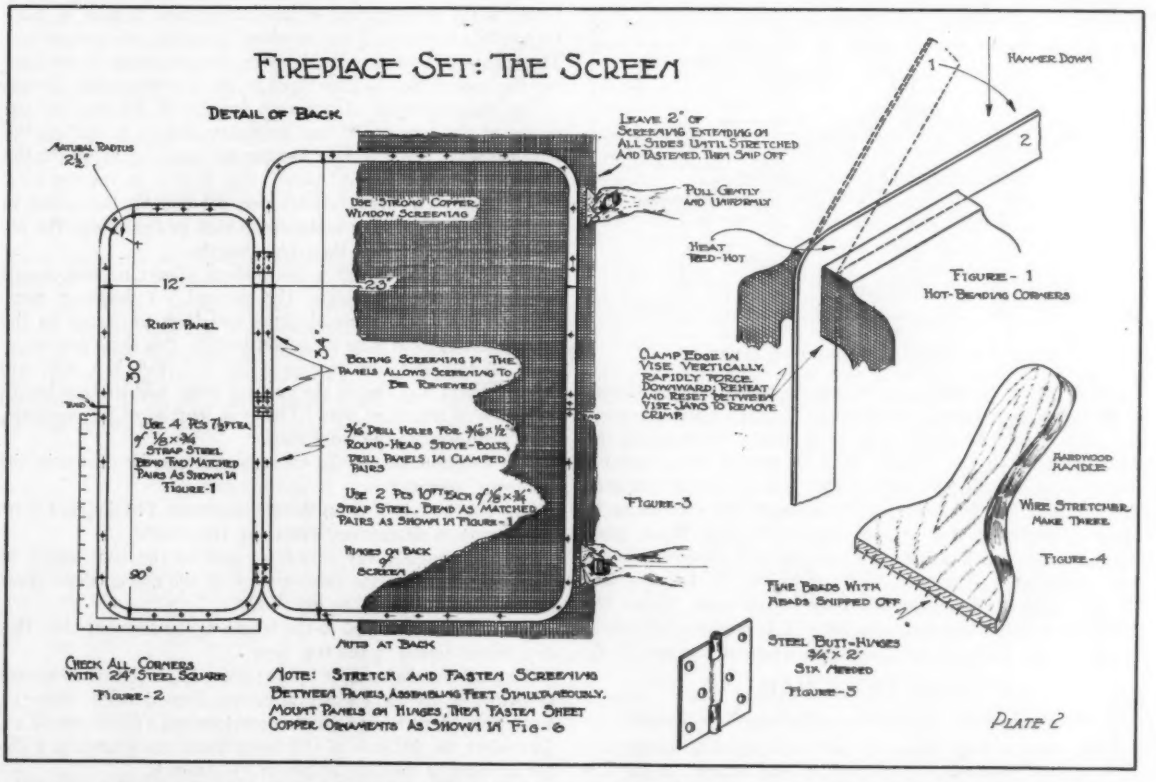
The Center Panel. The center panel, 23 by 34 in., is next made. The operations in forming this pair are a repetition of those followed in making the wing panels.

An allowance is given in the lengths of the pieces so that it will be necessary to saw off a slight surplus when the ends are being butted. All holes should be drilled while a pair of the frames are held together by clamps. Locate all centers with a center punch. When assembling a pair of frames, care should be taken to have the butted joints come on opposite sides.

Forming Feet and Handles. The six feet, and the three handles are easily forged, but care must be exercised to make them uniform in size and shape. The holes for attaching the feet and handles should be marked through from those drilled in the panels. These are fastened to the panels by stove bolts during the operation of stretching the copper screening.

Stretching the Screening. Before inserting the screen, all steel parts should be rubbed down to shiny metal using coarse emery cloth. Then apply two coats of flat black brushing lacquer. Assistance will be needed for fastening and stretching the screen. By making the three screening stretchers shown in Figure 4, the screen may be drawn to tightness as it is laid between a pair of frames. It is advisable to cut the screening so that at least 2 in. will extend beyond the outer edge of the panels. This is done so that the screen will withstand the pull of the stretchers. Begin by bolting the screening at one side between a pair of frames, being careful not to injure the




FIREPLACE SET: THE SCREEN
DETAIL OF BACK
NATURAL RADIUS 2½"
USE STRONG COPPER WINDOW SCREENING
LEAVE 2" OF SCREENING EXTENDING ON ALL SIDES UNTIL STRETCHED AND FASTENED. THEN SNIP OFF
PULL GENTLY AND UNIFORMLY
12"
29"
RIGHT PANEL
30"
34"
BOLTING SCREENING IN THE PANELS ALLOWS SCREENING TO BE RENEWED
USE 4 PCS 7½" EACH OF ½ × 3/16 STRAP STEEL. BEND TWO MATCHED PAIRS AS SHOWN IN FIGURE-1
3/16" DRILL HOLES FOR 3/16 × ½" ROUND-HEAD STOVE-BOLTS. DRILL PANELS IN CLAMPED PAIRS
USE 2 PCS 10" EACH OF ½ × 3/16" STRAP STEEL. BEND AS MATCHED PAIRS AS SHOWN IN FIGURE-1
RIVETS ON BACK OF SCREEN
90°
NUTS AT BACK
CHECK ALL CORNERS WITH 24" STEEL SQUARE
FIGURE-2
NOTE: STRETCH AND FASTEN SCREENING BETWEEN PANELS, ASSEMBLING FEET SIMULTANEOUSLY. MOUNT PANELS ON HINGES, THEN FASTEN SHEET COPPER ORNAMENTS AS SHOWN IN FIG-6
HEAT RED-HOT
CLAMP EDGE IN VISE VERTICALLY. RAPIDLY FORCE DOWNWARD; REHEAT AND RESET BETWEEN VISE-JAWS TO REMOVE CRIMP
FIGURE-3
HAMMER DOWN
1
2
FIGURE-1
HOT-BENDING CORNERS
HARDWOOD HANDLE
WIRE STRETCHER MAKE THREE
FIGURE-4
FINE BEADS WITH HEADS SNIPPED OFF
STEEL BUTT-HINGES ¾" × 2" SIX NEEDED
FIGURE-5
PLATE 2

screening. Adjust it so that it lies smoothly with the wire strands lying parallel to the frame edges. Then fasten one side with stove bolts and nuts. Then have an assistant help in drawing the screen taut with the stretchers, after which the other side may be fastened with stove bolts. The ends should next be fastened in a similar manner. Have the heads of all bolts face toward the sides chosen as the front of the screen. The butt hinges are to be placed on the back. Then the handles and feet are fastened in place.

Forming and Attaching Ornaments. Suitable paper patterns

of the wild ducks, trees, cat-tails, and reeds should next be sketched and cut out. (See Plate 3.) These are attached to No. 18 B. &. S. gauge sheet copper, using library paste. Using the snips and small sharp cold-chisel, the ornaments are cut out, and the pattern paper is then removed with warm water. File all edges smooth, and with a light mallet blow straighten each piece until it will lie flat.

Attaching the Ornaments. Small staples made of bare copper wire may be bent the shape of a double-pointed tack and attached with a drop of solder to the backs of the ornaments. These staples should be generously used. The method of attaching the ornaments to the screening is to simply push the points through the screening working from the front. As each is located in the proper place, bend the staple points over snugly, being careful not to injure the screening. This method permits the removal of the ornaments should it become necessary, during the life of the screen, to renew the screening.

Enriching the Ornaments. If it is desired to color the ornaments by chemical action, it should be done before attaching them to the screen. The first step in the process is to thoroughly clean the sheet copper, using either steel wool or acid pickle. Each ornament should be toned separately using an antiquing solution. If the wild ducks are dipped in an acetic-acid solution, then exposed to the fumes of ammonia for a few hours, they will turn a mixture of black, blue, and green colors. These two chemicals are easily procured as acetic acid is one form of vinegar, and household ammonia may be obtained at any grocer.

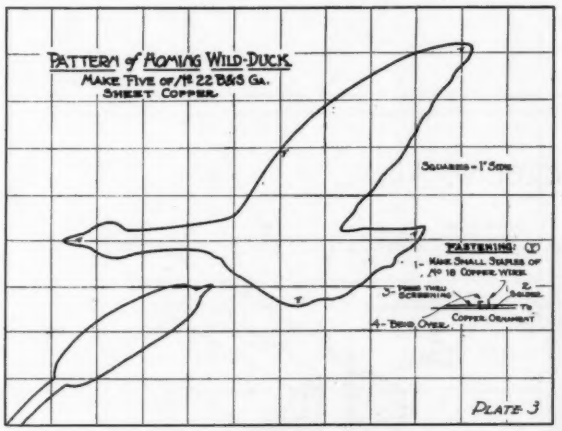


Plate 3 — Details of fire-screen ornament

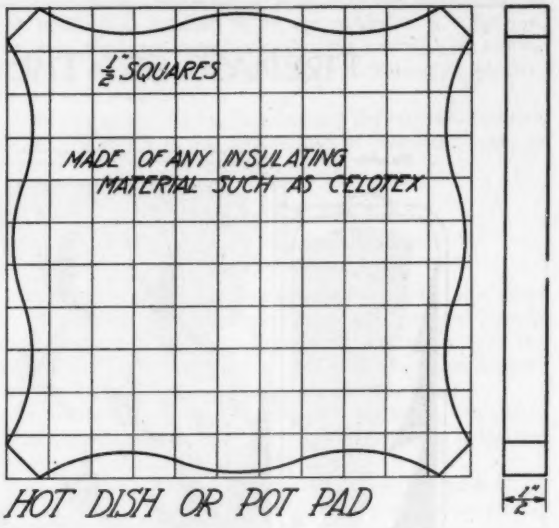
The trees, reeds, and cat-tails may be toned varying shades of verdigris by daubing the surfaces (outer) using commercial nitric acid. The shades may be deepened by repeating the applications until the desired effect is secured. A serviceable dauber may be made by rolling up a ball of cotton waste to the size of a small walnut, and twisting a stiff wire about it. Make a handle of this wire at least 8 in. long. When using commercial-strength acid, smoky fumes will arise which are very irritating to the membraneous linings of the nose and throat; therefore, perform this work in the open. Permit the copper to lie flat while puddling the acid. It requires fully three hours for the acid to form a desirable strata of copper nitrate.

HOT-DISH PAD

C. M. Jochem, Jr., Pompton Lakes, New Jersey

Very often a short practical job is required to keep some fifth grader profitably employed in the school shop. The little hot-dish pad described herewith has proved to be a very useful as well as popular project.

The designs which can be used are unlimited. Each boy may be required to make a new one, quite different from any that his fellow students may have produced.



The sizes may also vary, to accommodate the varying sizes of the plates or pots.

The material used may be any insulating board, such as Celotex. The edges are painted in various colors, care being taken not to spot the faces of the pad.

THE DEVELOPMENT OF AN OBLIQUE CONE

Howard C. Nelson, High School, Monmouth, Illinois

A mechanical-drawing problem which sometimes causes difficulty is the development of an oblique cone. It may be comprehended, however, if the involved principles are understood. The subsequent paragraphs describe the procedure of developing the cone which is illustrated in the accompanying layout.

The determination of the true lengths of the various elements of the cone is the first necessary process in making the development. The true lengths may be found by revolving the elements into the vertical plane; this is done in the top view of the cone. The front view shows all lines in this plane in their actual length, hence the front-view projection of the revolved elements shows their true lengths.

The element V-O lies in the vertical plane; its true length is shown on the front view. The element V-1, however, must be revolved to the vertical plane and then projected to the front view to determine its actual length; this same procedure must be followed with elements V-2, V-3, V-4, V-5, V-6, and V-7. Element V-8 lies in the vertical plane and its true length is shown in the front view. The true lengths of all elements, then, are found in the front view.

The development of the cone should then be drawn in the following manner:

Lay out the line V-O on the development. The distance of its true length is determined from the front view.

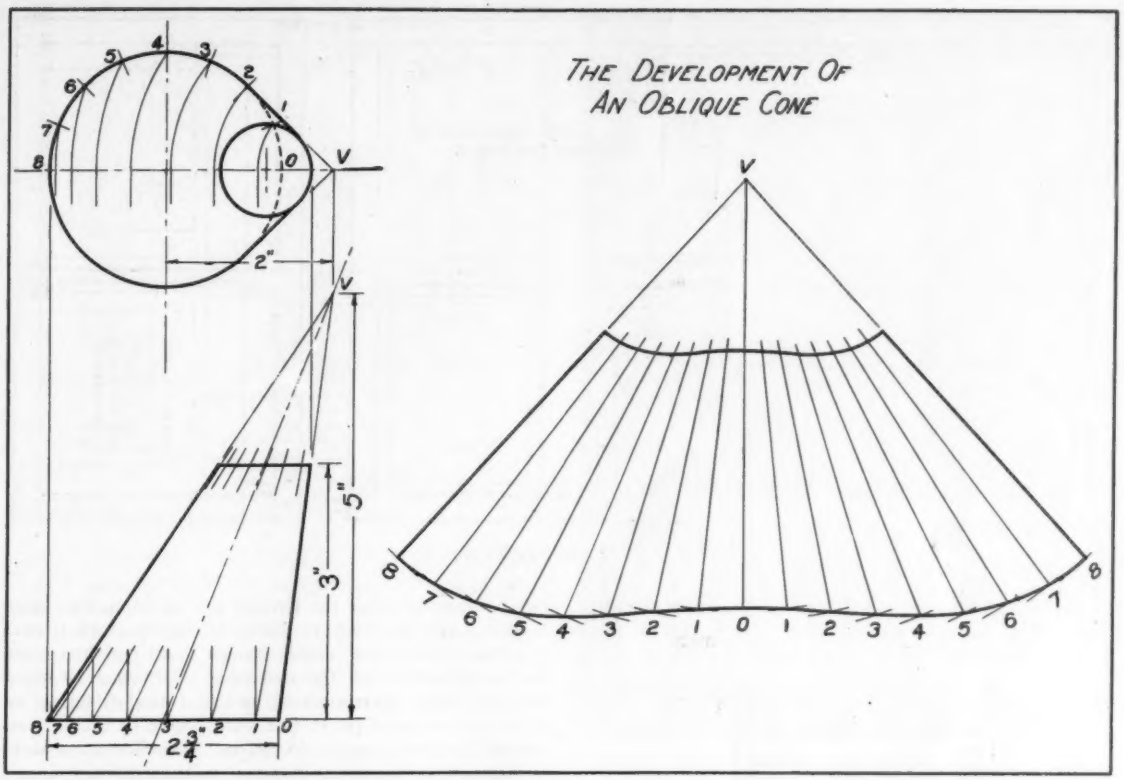
Set the compass for a radius equal to the true length of V-1 and with V on the development as the center, draw short arcs on both sides of the line V-O.

Set the dividers equal to the length of the segment O-1. This distance is found in the top view.

Step off the distance O-1 from point O on the development to points on the arcs which have just been drawn. Points 1-1 have now been located on the development. These points are located at the distance of O-1 from O and are located at a distance equal to the true length of V-1 from V.

In a similar manner, locate the points 2-2, 3-3, 4-4, 5-5, 6-6, 7-7, and 8-8 on the development. Connect these points by using an irregular curve.

The curve at the upper end of the development of the truncated oblique cone may be determined in this way:



Draw all of the elements on the development.

In the front view, draw the true length lines for the various elements until they intersect the top of the truncated cone. The true distance from the vertex, V, to the top end of the truncated cone may then be transferred with the dividers to the various elements of the development. These points, of course, are then connected by using the irregular curve.

A FISHING-TACKLE BOX

C. Anthony Van Kammen, Grand Rapids, Michigan

Box problems are always interesting to boys, especially when they serve an immediate need. What boy is there who would not enjoy owning a fine fishing-tackle box and one that he can say he made all by himself? Such a problem was given to a class of seventh-grade boys as an alternate for the four- or six-compartment nail box shown in Figure 1. The new problem involved a little more work and material, but was worth the effort (see Fig. 2). The stock bill follows:

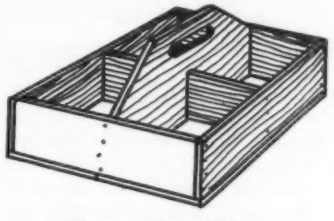


Fig. 1. The nail box

Stock Bill

Finished Size				*Rough Size*				*Part*
2 pc.	11	x 3	5/8 x 3/8	12	x 4	1/8 x 5/8		Sides
2 pc.	6 1/2	x 3	5/8 x 3/8	7 1/2	x 4	1/8 x 5/8		Ends
2 pc.	11	x 3	5/8 x 3/8	12	x 4	1/8 x 5/8		Bottom
1 pc.	6 1/2	x 3	x 3/8	7 1/2	x 3	1/2 x 5/8		Short Partition
1 pc.	10 1/4	x 3	x 3/8	11 1/4	x 3	1/2 x 5/8		Long Partition
1 pc.	11	x 7	1/4 x 3/8	12	x 7	3/4 x 5/8		Top
2 pc.	10 5/32	x 1	x 3/8	11 5/32	x 1	1/2 x 3/8		Long Tray Side
2 pc.	6 9/32	x 1	x 3/8	7 9/32	x 1	1/2 x 3/8		Short Tray Sides
7–10 pc.	2 21/32	x 1	x 3/8	3 21/32	x 1	1/2 x 3/8		Tray Part and Ends
1 pc.	10 5/32	x 2	29/32 x 3/8	11 5/32	x 3	13/32 x 3/8		Long Tray Bottom
1 pc.	6 9/32	x 2	29/32 x 3/8	7 9/32	x 3	13/32 x 3/8		Short Tray Bottom

The box was put together with plain butt joints, casein glue, and 3d box nails. The water-resistant glue was used because the box may be put in damp places. The two partitions which intersect each other were joined with a cross-lap joint, made by hand. After the joint was made, one half of the short member was cut lower to allow for the insertion of the long tray used for hooks, sinkers, leaders, etc. The partitions were nailed in the box after the completely sealed box was cut in two. Make sure that the partitions are square with the sides and ends and that they are seated at the bottom before driving the nails home. The two small compartments formed may be used for reels, while the larger ones can take care of casting baits, etc.

All stock for the class was cut at the machines to the desired length, width, and thickness. The surfaces of all pieces, however, were hand planed by the boys to remove all mill marks before assembling. As the box was to be cut in two at the circular saw to form a base and cover there-

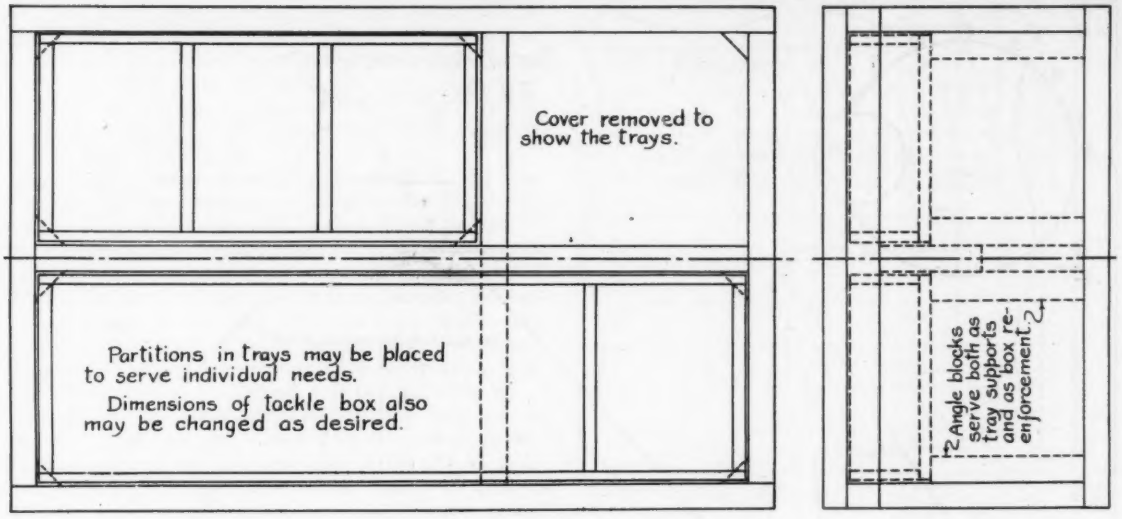

Cover removed to show the trays.
Partitions in trays may be placed to serve individual needs.
Dimensions of tackle box also may be changed as desired.
Angle blocks serve both as tray supports and as box reenforcement.

Fig. 2. Fishing-tackle box

fore, the sides and ends were made ⅛ in. wider than the finished size to allow for the saw kerf. A thin piece of stock was inserted in the adjoining saw kerfs of a side and end as soon as they were cut, so that when the other cuts were made the box and cover could not squeeze shut and spoil the fit of the box and cover. Remember to cut the kerf near the face of the box which is made in one piece. It will be noted that the bottom is made of two pieces with the butt joint under the center partition. It is important that the saw kerf be cut the correct distance from the bottom or else the partitions will be above or below the top edge of the box part proper.

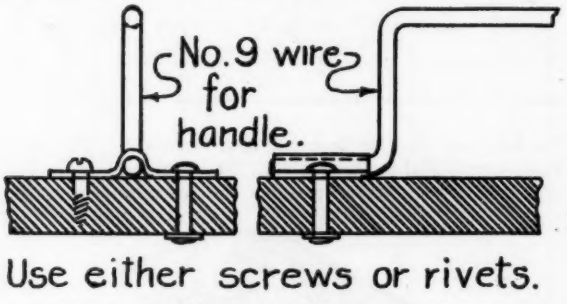


Fig. 3. Wire handles for the fishing-tackle box

Stock for the trays was made from resawed lumber. This can be done at either the circular saw or band saw. Before resawing, cut the stock to width, as narrow stock is easier to resaw. If the stock is thick enough to get out three pieces, the rough surface of the remaining thick piece should be surfaced before again resawing, so that a finished surface will be on each resawed piece. The stock should be dressed thick enough for hand planing to finished size. The trays should be assembled with casein glue and nailed with very fine ½-in. box nails. The tray bottoms are cut square and if properly glued and nailed will square up the trays. Partitions in the trays may be placed at will.

Fig. 4. The boys with their fishing-tackle boxes

Two types of hinges were used for fastening the cover — butt hinges and surface hinges. If the former are used, lay out the gains and secure them in place. In case fancy surface hinges are used, lay out the screw holes and fasten them in place. The hinges may be obtained either in brass or in a nickle-plated finish. A tiny hasp and padlock were used on the front of the box. The finish of these should, of course, match the hinges.

For a handle, a piece of No. 9 gauge wire, bent to the shape shown in Figure 3, is used. The ends are held in place by two pieces of brass or copper drilled for screws and bent to receive the ends of the wire handle. This type of handle will lay almost flush on top of the cover and makes it easy to stow away.

The tackle boxes were painted in various colors: gray, black, white, and red. Both the box and the trays were painted inside and out with two coats of color. Figure 4 shows members of the class and their tackle boxes.

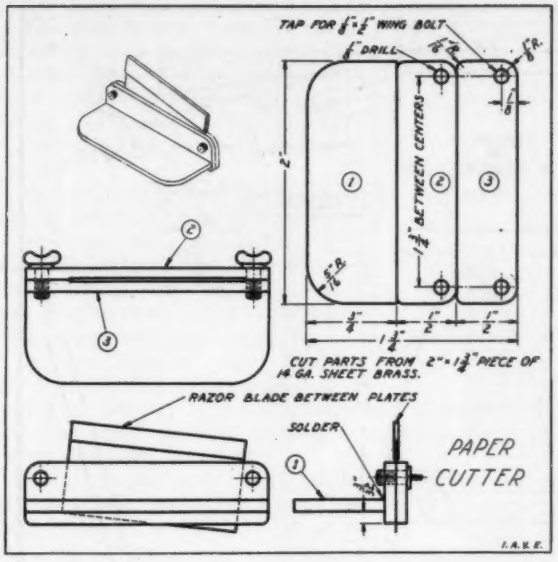
A PAPER CUTTER FOR THE DRAFTING ROOM

Homer Baldwin, High School, Columbia, South Carolina

In the drafting room it is often necessary to cut a piece of paper into several pieces, cut off the edge in order to remove thumb-tack holes, or to cut tracing paper to the proper size. This is usually done with a knife or razor blade held against the edge of the T square, or with a pair of scissors. Cutting paper with scissors takes time and often does not do a neat job. A knife or razor blade will sometimes slip and cut the T square.

The paper cutter described here will cut the paper quickly and neatly without endangering the T square or board and may be made at a cost of only a few cents by anyone handy with tools.

Cut pieces Nos. 1, 2, and 3, to the dimensions shown, from a piece of 14-gauge sheet brass. Drill and tap the



necessary holes and solder the straightedge of No. 1 to No. 2 as illustrated.

The razor blade, placed between Plates 2 and 3 and screwed down with wing bolts, is slanted in the manner shown to prevent it from digging into the paper, and should be set at such a depth that it will not cut through the paper into the board.

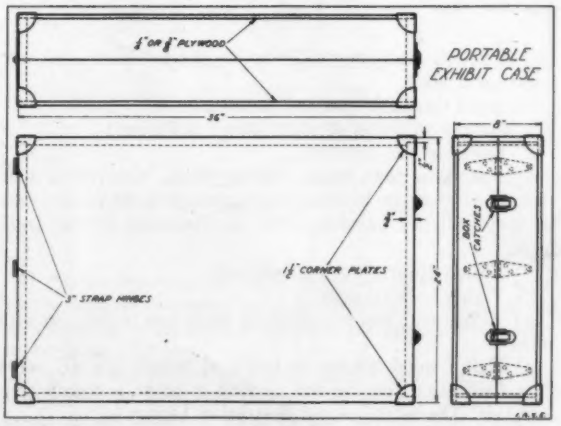
To use the paper cutter, lay the T square along the line to be cut. Place the cutter so that Plate 1 lies on top of the T square with the blade on the line to be cut. Then press the cutter down and slide it along the edge of the T square.

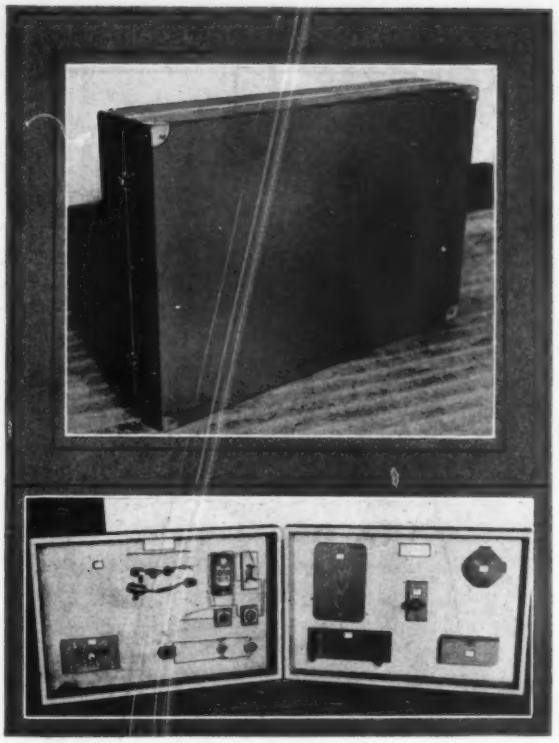
PORTABLE EXHIBIT CASE

A. P. Twogood, Director Industrial Education, Newton, Iowa

The industrial-arts teacher frequently is confronted suddenly with an opportunity to exhibit some of the work of his classes. Under present conditions he must take advantage of every one of these opportunities. Ordinarily, this involves much work in collecting and arranging projects.

To solve this problem our department constructed three portable exhibit cases as pictured in the accompanying illustration. Into one case was put a display of 7B drawings on one side, and 9B drawings on the other. The drawings were made up in booklet form, and contained work from a number of pupils. Another case contains a display of 7A woodworking and 8B electrical problems. The third contains specimens of 8A metal work. With very little effort the instructor can keep these display boxes up-to-date, thus being ready to provide





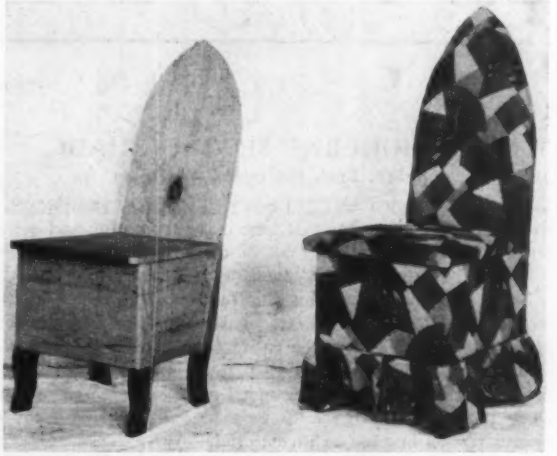
Upper — The portable display case ready to go out for an exhibit

Bottom — The electrical and elementary woodworking display

The electrical display shown was not complete when picture was taken

a display for a store window, a P.T.A. meeting, or for any other place, at a moment's notice.

When opened, each base has twelve square feet of display surface, enough to display a comprehensive selection of projects to show what is being done. By arranging the open boxes in pyramid form, two at the base and one above, the entire display can be placed in a space only 12 ft. wide. Projects are fastened to the panels by means of screws from the outside of the box. Our cases are finished natural inside and dull black outside, but any finishing plan may be used.



Art Moderne sewing chair designed by Herbert Bast

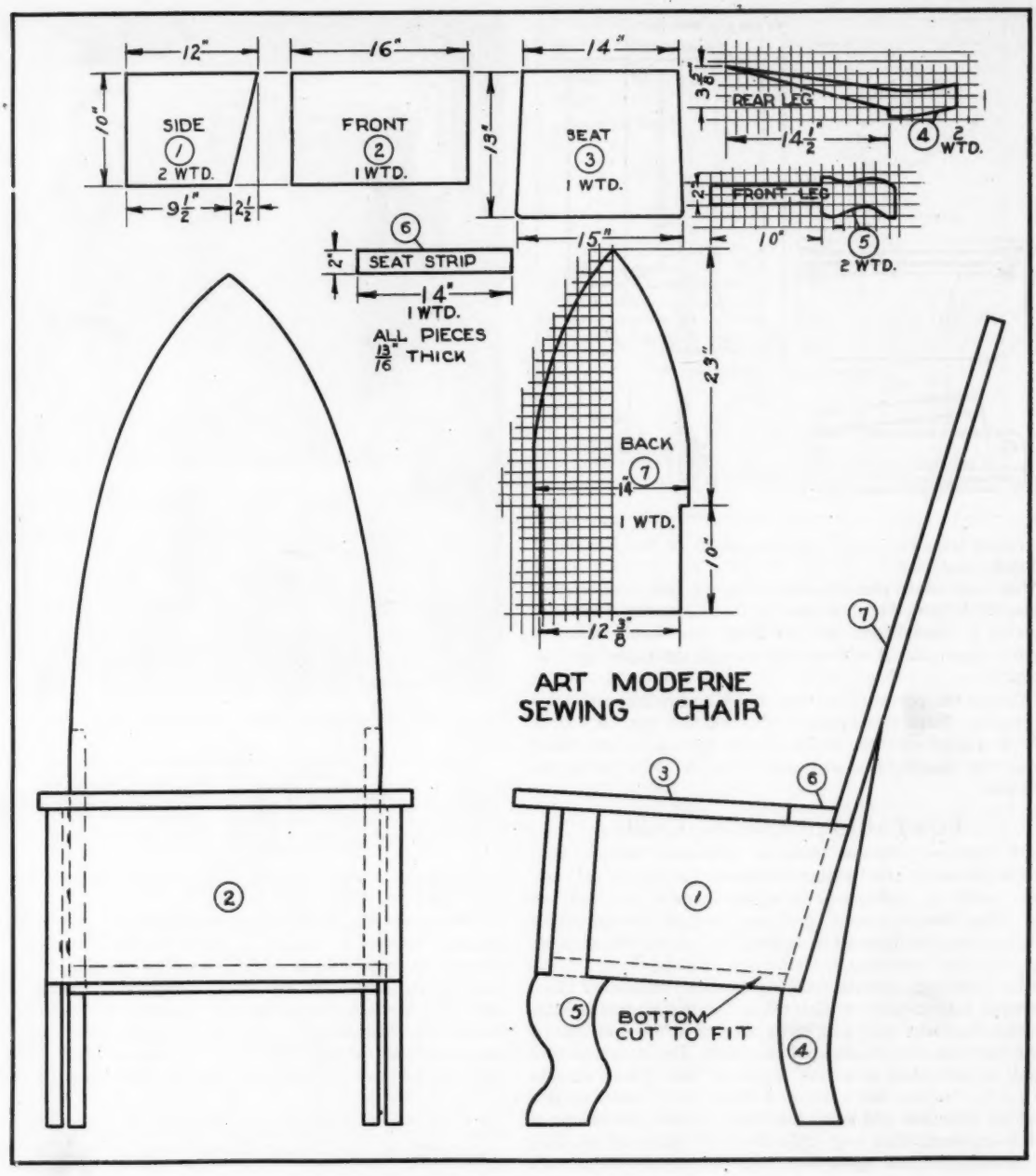


Fig. 1. Details of sewing chair

ART MODERNE SEWING CHAIR

Herbert Bast, Sheboygan, Wisconsin

The sewing chair illustrated herewith is simple and inexpensive to make, and at the same time it is very useful, and quite ornamental. The wood need not be of the selected type, as it will all be covered with the upholstery material.

Since cretonne is used for this purpose, this too, is quite inexpensive. Remnants will frequently serve, as 2½ yds. of 36-in. material will cover the entire chair. This amount, however, will do only if an over-all pattern is used. If a pattern be selected where a design or motif must be centered on the chair an extra allowance must be made, as centering a cover always results in a waste of material.

As you will note that the seat and the inside back only require stuffing in the upholstering, this can be done with cotton felt or cotton wadding which can be purchased at most any department store.

To make this chair, proceed as follows:

1. Cut the 10 pieces of wood shown in Figure 1.
2. Assemble the frame.

a) Fasten the front legs to the side pieces. This can be done with screws but the heads of the screws must be countersunk so they will not interfere with the fastening of the front piece.

b) Fasten front piece to front legs.

c) Fasten back to sides.

d) Attach rear legs to outside of back, legs to be even with sides.

e) Nail a wood bottom on inside of frame, this will serve as a foundation for the box as well as make a sturdy construction. The bottom is not detailed in Figure 1.

The chair is now ready for upholstering, as it is more convenient to cover the sides, front, and inside back before attaching the seat to the frame.

Proceed with the upholstering as follows:

a) Cut cover as outlined (where over-all pattern is used) in Figure 2.

b) Cover sides of chair. The cover to be tacked to front, back, and bottom of frame, the top of the side covering to be tacked to the top of the frame with edges turned in.

c) Cover front of chair. Front piece of covering to be tacked on with gimp tacks or colored upholstery nails to match covering. The top of the front covering is tacked on top of the frame with edges turned in.

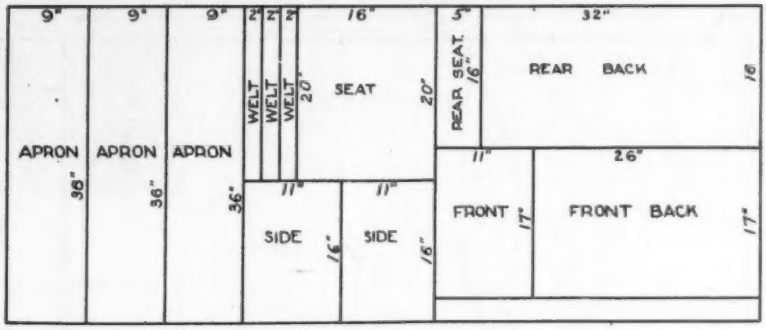


Fig. 2. Layout for covering material

d) Cover inside back. Place a few layers of cotton felt on the inside back (number of layers depending on thickness of felt), allowing the cotton to extend over the wood edge so the cover will not be cut by the sharp edges. Tack the cover to the rear of the frame. The tacks placed on the bottom of the inside back must be low enough so they will be covered with the seat strip.

e) Cover seat strip. Place a layer of cotton on strip and cover all around, cover to be tacked on bottom of strip.

f) Fasten seat strip to top of frame. To prevent the back from pulling off the sides, the strip should be fastened to the top as well as to the back. Use screws to fasten the seat strip to the back.

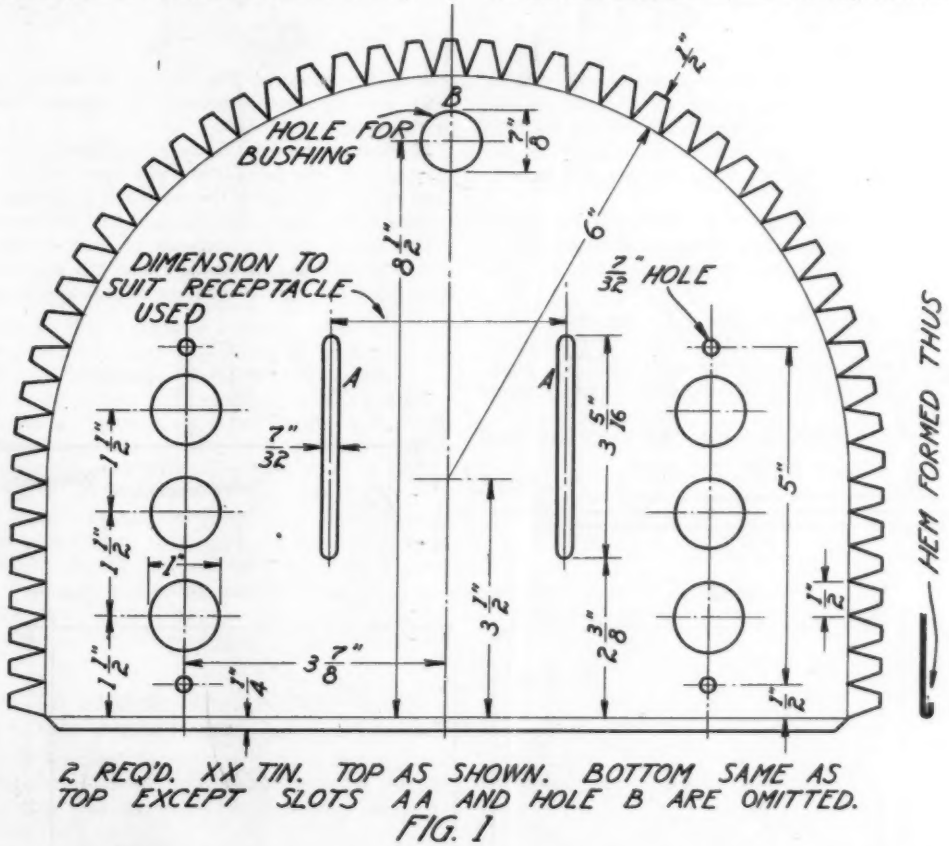
g) Cover rear back. Cover to be tacked on with gimp tacks or colored upholstery nails to match covering, with side edges turned in and bottom of cover tacked to bottom of frame.

h) Covering seat. Place a few layers of cotton on seat top and stretch the cover over. The cover should be tacked to the bottom of the seat frame. Attach seat top to seat strip with hinges; this will permit the seat top to open as a lid.

SMALL FLOOD LIGHT

B. D. Elliott, Allen C. Mason Intermediate School, Tacoma, Washington

Several 500-watt flood lights are handy things for the stage electrician. The one described in this article may be made for less than three dollars, and it is very serviceable.



2 REQ'D. XX TIN. TOP AS SHOWN. BOTTOM SAME AS TOP EXCEPT SLOTS AA AND HOLE B ARE OMITTED.

FIG. 1

The material used is XX tin, and ninth-grade students of sheet-metal work encounter few difficulties in its construction.

It is best to make the top and bottom pieces, Figure 1, first, so that if some small mistakes in measurements are made, they may be rectified in cutting the material for the body. After cutting the slits for the flaps around the outside of the top and bottom pieces, turn alternate flaps up at right angles.

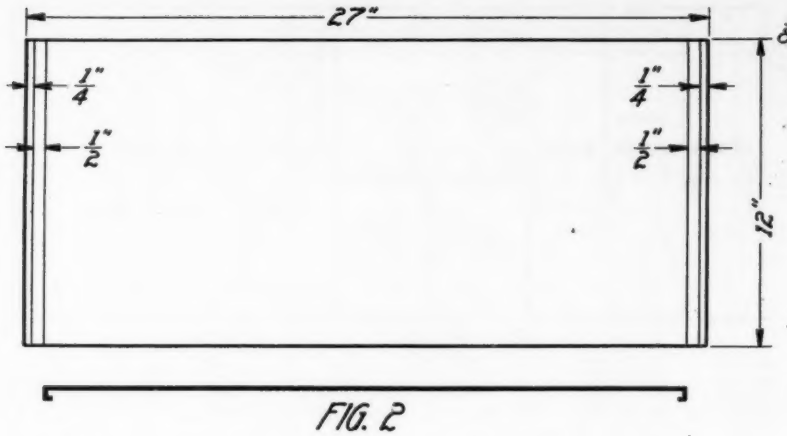


FIG. 2

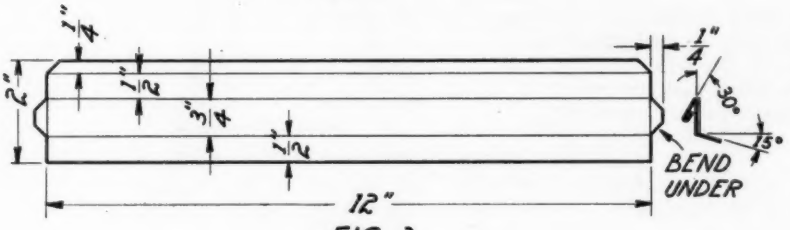


FIG. 3

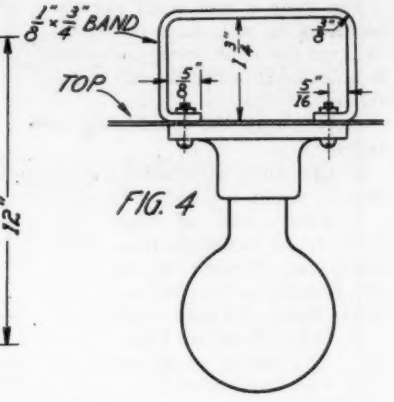


FIG. 4

VENTILATOR COVERS 8 REQ'D.

FIG. 5

Next place a small drop of solder on the outside of each one of the flaps that have been turned up. Then cut out and shape the body piece shown in Figure 2, and after it has been placed in position around the ½-in. flaps on either the top or bottom piece, clamp the two parts together and securely sweat the flaps in place.

To further stiffen and lightproof the entire job, run a bead of solder around the entire inside corner where body and end piece meets. The other end piece is then put on in the same way.

The next job is to make the guides for the slides. These are cut as shown in Figure 3, and after they have been bent to the required shape, they are soldered on the top and bottom pieces, the unhemmed flange being soldered on the inside of the lamp.

A large porcelain receptacle suitable for a 500-watt lamp must then be procured. The slots AA, in the top, must be cut so as to fit the distance between the fastening bolts required by this receptacle.

The holder shown in Figure 4 is placed on the outside of the top and held in position with the same 10—24 2-in. brass screws with which the receptacle is fastened. A federal bushing is next placed into the ⅞-in. hole B shown in Figure 1.

Because of the large amount of heat developed by the bulb it is necessary to ventilate both top and bottom of the flood light. The ventilator covers, of which eight are required,

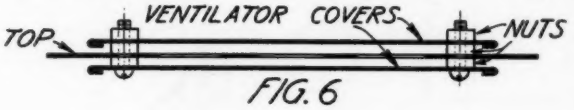


FIG. 6

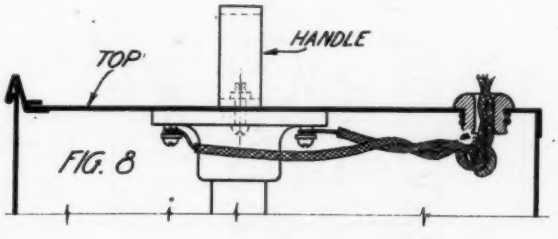


FIG. 8

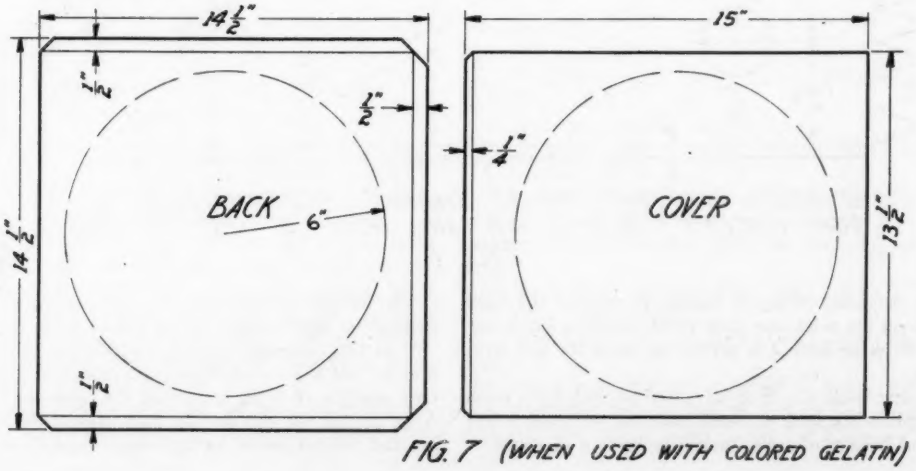
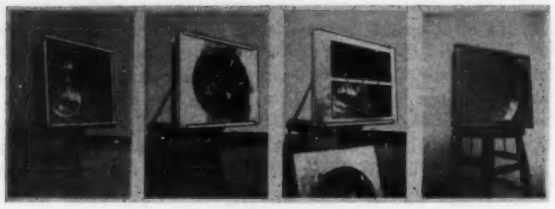


FIG. 7 (WHEN USED WITH COLORED GELATIN)



The assembled flood light

are shown in Figure 5, and the method of applying them is illustrated in Figure 6.

Figure 8 shows a sectional drawing ready for wiring. If flexible wire is used it may be held in place by an underwriter's knot, the lid coming through the porcelain bushing. If solid covered wire is used, it is wise to make a small clamp to hold it in place.

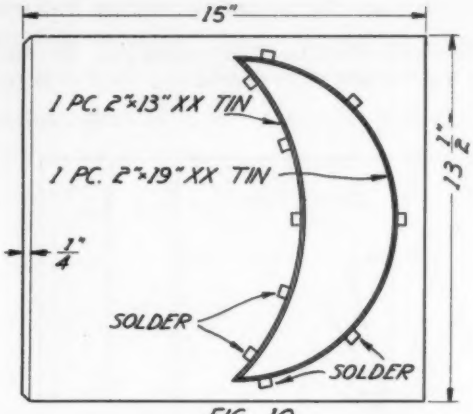


FIG. 10

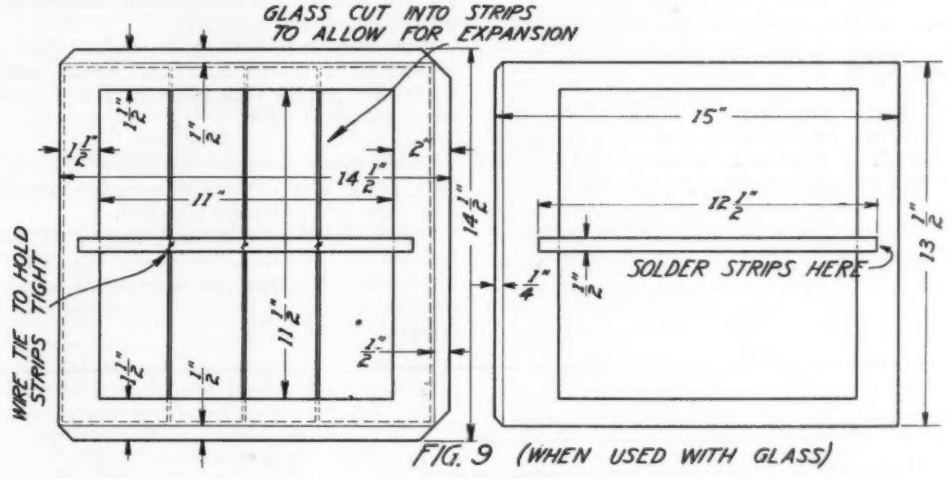


FIG. 9 (WHEN USED WITH GLASS)

The color screens consist of a cover and a back made of tin. Their construction is shown in Figure 7. After they have been constructed, the cover is slipped into the back piece and a compass used to mark out a 12-in. circle. The point of the compass should be pressed hard enough to show an indentation on both pieces. The back and cover are then taken apart and the 12-in. disk cut out of each. Ordinary colored gelatin may be used between the two pieces and three or four of the screens will be necessary for each flood light.

If a more permanent medium than colored gelatin is to be used, colored glass may be substituted, the only difference in construction being that the back and cover are made as shown in Figure 9. Both cover and back need reënforcing at the center and this is done by the tie strips. The colored glass will have to be cut into 3-in. strips to provide for expansion due to heat.

PROJECTS MADE OF ANGLE IRON

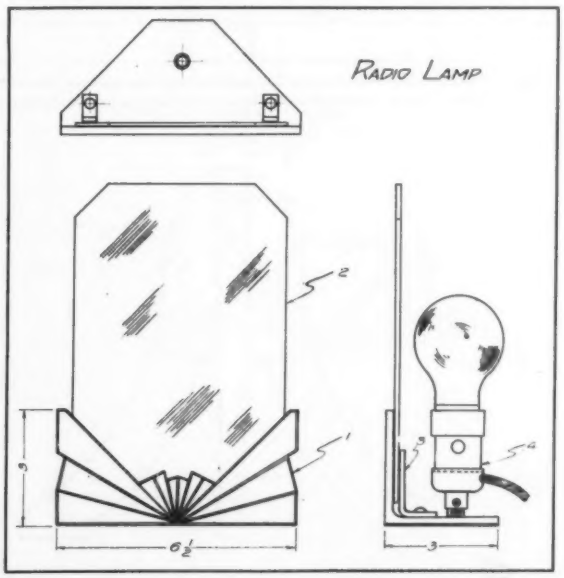
Rowland L. Hill, Vocational School, Jackson, Michigan

The projects described herewith were made out of scrap pieces of angle iron. Schools may obtain this scrap cheaply, and frequently get quantities gratis from manufacturing firms using angle iron.

Radio Lamp

A project which lends itself to a variety of types of work and affords an opportunity for individual design, is the radio lamp shown in the accompanying drawing. The lamp provides work for the machine or general shop, for the electric shop, and for the art department.

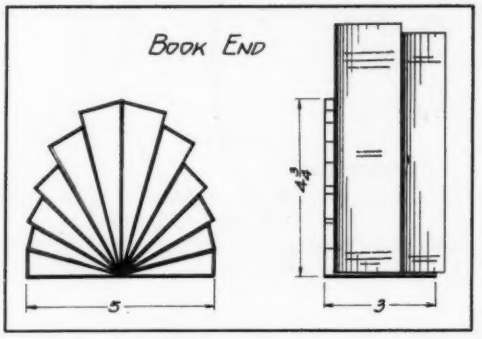
The base (Part 1) is made of a piece of 3 by 3-in. angle iron, 6½ in. long. It is machined on one side, either on the milling machine or the shaper. The grooves are then milled on this finished surface with a 90-deg. double-angle cutter. They are made about 1/16 in. deep and 15 deg. apart. The next step is to cut out part of the surface to form the desired design. This may be done by drilling and hand sawing, after



Radio lamp with angle-iron base

which the edges are filed to conform with the V-shaped grooves.

Part 2 is a piece of 5½ by 8½-in. frosted glass. All edges should be honed smooth on an oilstone after the glass is cut to shape.



Book ends made of angle iron

The glass is held in place by two brackets made of ⅛ by ⅜-in. iron. These brackets are riveted to the base, leaving just enough space to insert the glass. A thickness or two of paper between the glass and angle iron holds the glass firmly.

Part 4 is a light socket with a hole in the side of the cap for the wires to enter. The socket is fastened to the base of the lamp by means of a short piece of ⅛-in. pipe, screwed into the angle iron.

A piece of felt should be glued to the bottom of the lamp base to keep it from marring finished surfaces.

A bright-colored transfer of a parrot was used for decorating the glass on the original lamp. But just as the glass and the base offer opportunities for individual design, so transfers of birds, ships, flowers, silhouettes, organization emblems, or hand paintings may be used to decorate the glass.

The metal base may be finished in several ways. The most popular finish has been to polish all surfaces. Another pleasing finish is to heat the iron very slowly, until the desired color effect has been produced. Either of the two preceding finishes should be followed by a coat of clear lacquer to prevent tarnishing and rusting.

The base may also be painted, in which case there are many combinations of colors available. Each section between the grooves may be painted a different color. The school colors, for instance, may be used. An antique finish is also very attractive.

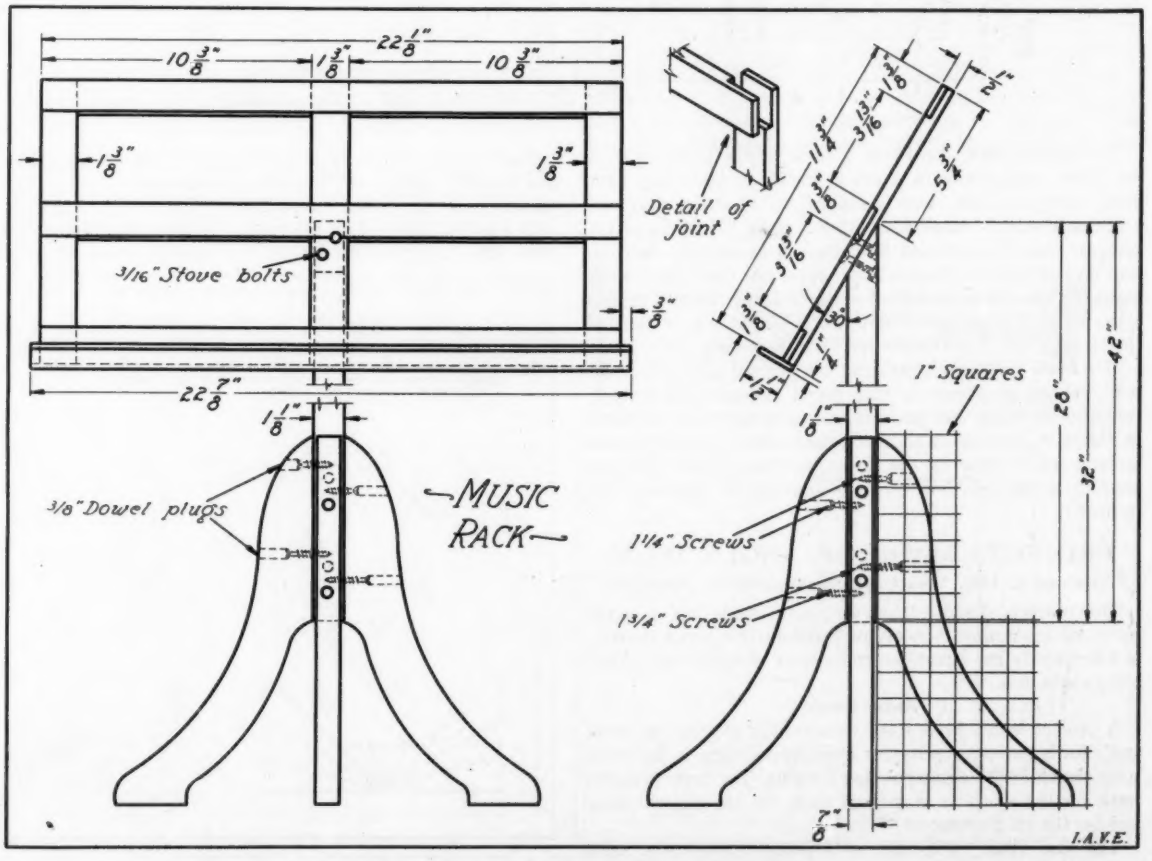
The same base described for the radio lamp also may be used for holding a mirror or picture. The only difference would be that the brackets would have to be riveted on so that they accommodate the thickness of the picture frame or the mirror. The length of the base probably may have to be changed in order to suit the size of picture.

If the mirror is to be tilted, the brackets should be made to conform to the desired slant. Small wooden wedges between the brackets and the angle iron may be used to hold the mirror or picture in place.

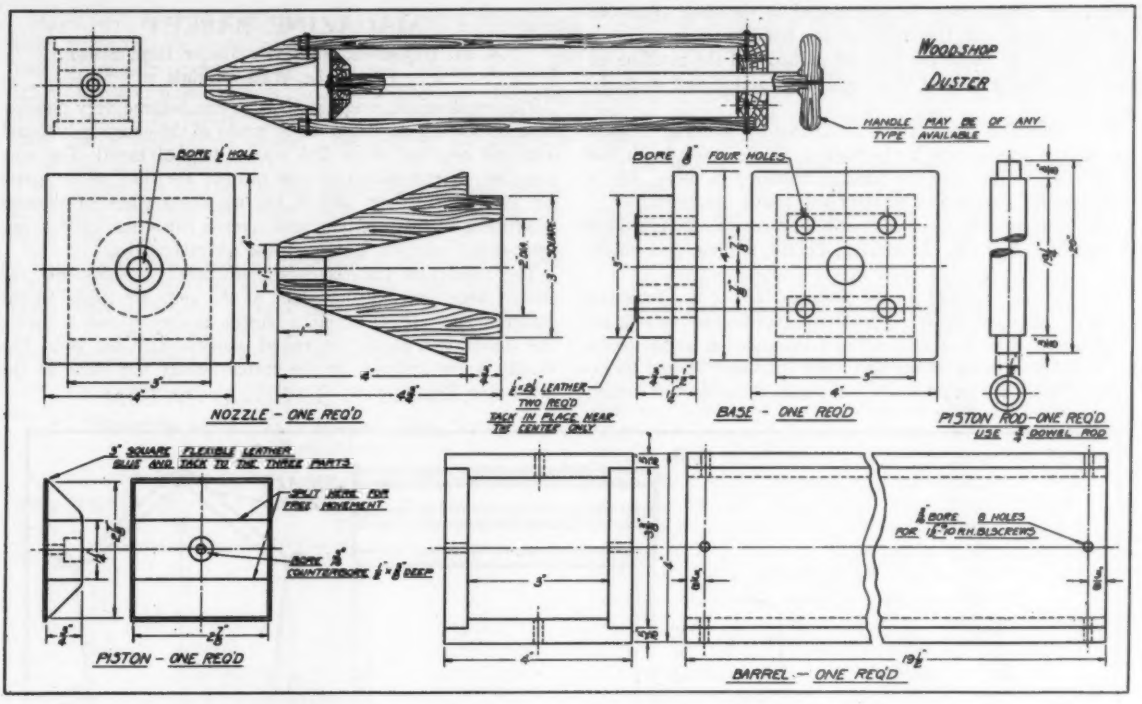
Book Ends

Attractive book ends also may be made to match the radio lamp. The set illustrated herewith requires two pieces of 3 by 5-in. angle iron, each piece 5 in. long.

The machining and finishing is done by the same methods used for the lamp base. The smaller side of the angle iron which slides underneath the books should be machined to a thickness of ⅛ in., at the same time cutting away the fillet to produce a square corner.



Music rack designed by M. L. Klein, High School, Naperville, Illinois


WOODSHOP DUSTER
HANDLE MAY BE OF ANY TYPE AVAILABLE
BORE ½ HOLE
NOZZLE - ONE REQ'D
BORE ⅜ FOUR HOLES
BASE - ONE REQ'D
PISTON ROD-ONE REQ'D
USE ⅜ DOWEL ROD
5" SQUARE FLEXIBLE LEATHER GLUE AND TACK TO THE THREE PARTS
SPLIT HERE FOR FREE MOVEMENT
BORE ⅜ COUNTERBORE ¼" DEEP
PISTON - ONE REQ'D
BORE ⅛ 8 HOLES FOR 1½ NO. 8 R.H. BLSCREWS
BARREL - ONE REQ'D

WOODSHOP DUSTER

W. A. DeVette, Wilson Junior High School, Erie, Pennsylvania

At clean-up time nothing will be found so convenient for getting sawdust and shavings out of difficult corners as the blower shown in the accompanying drawing. This duster offers a good fill-in project for a couple of advanced boys.

Bill of Material

1 pc.	4	x 4	x 4¾	White Pine or Poplar	Nozzle
1 pc.	1¼	x 4	x 4	White Pine or Poplar	Base
2 pc.	½	x 3⅜	x 19½	White Pine or Poplar	Barrel Sides
2 pc.	½	x 4	x 19½	White Pine or Poplar	Barrel Sides
1 pc.	¾D	x 20	x ¾	Dowel Rod	Piston Rod
1 pc.	¾	x 1¼	x 2⅞	White Pine or Poplar	Piston Center
2 pc.	¾	x ⅞	x 2⅞	White Pine or Poplar	Piston Sides

1 Handle, as desired
1 Piston Face, leather, 3 x 3
2 Valve Strips, leather, ½ x 2½
8 Wood Screws, 1½-No. 10, r.h.blue
1 Wood Screw, 2½-No. 10, r.h.blue
1 Wood Screw, 2½-No. 10, f.h.bright

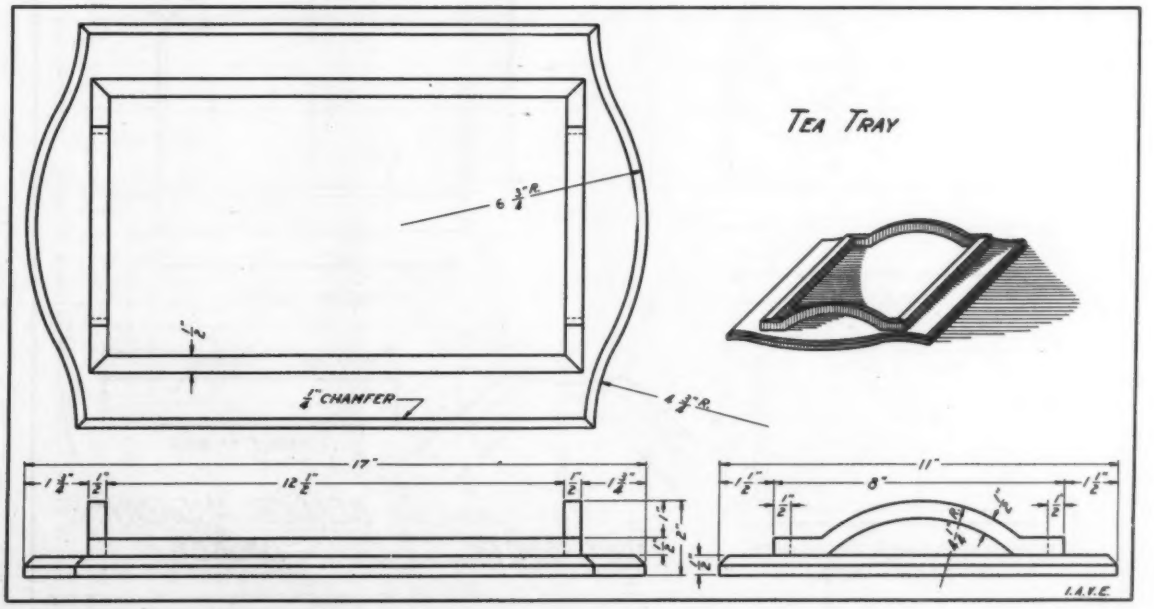
The construction need not be entered into in detail as the drawing is very specific and the assembly clear.

TEA TRAY

L. J. Webster, Lowell Junior High School, Madison, Wisconsin

The tea tray is a useful and interesting problem for a seventh-grade pupil. It is especially welcome as Christmas approaches, as a present for mother or sister.

It may be made of a number of different woods and it may be finished according to the individual desire of the pupils.



Elementary design may be introduced in deciding upon the general contour, and the shape of the handles.

One way is to make the base of walnut and the molding of some other material, and then finish by staining and shellacking.

White pine also proves to be a satisfactory material. If pine is used, the whole may be lacquered a jade green, with the top of the molding and the handles trimmed in ivory. For a center design, a stencil or transfer will prove very effective.

This problem introduces numerous processes. Among them are squaring, shaping, chamfering, boring, nailing, and mitering.

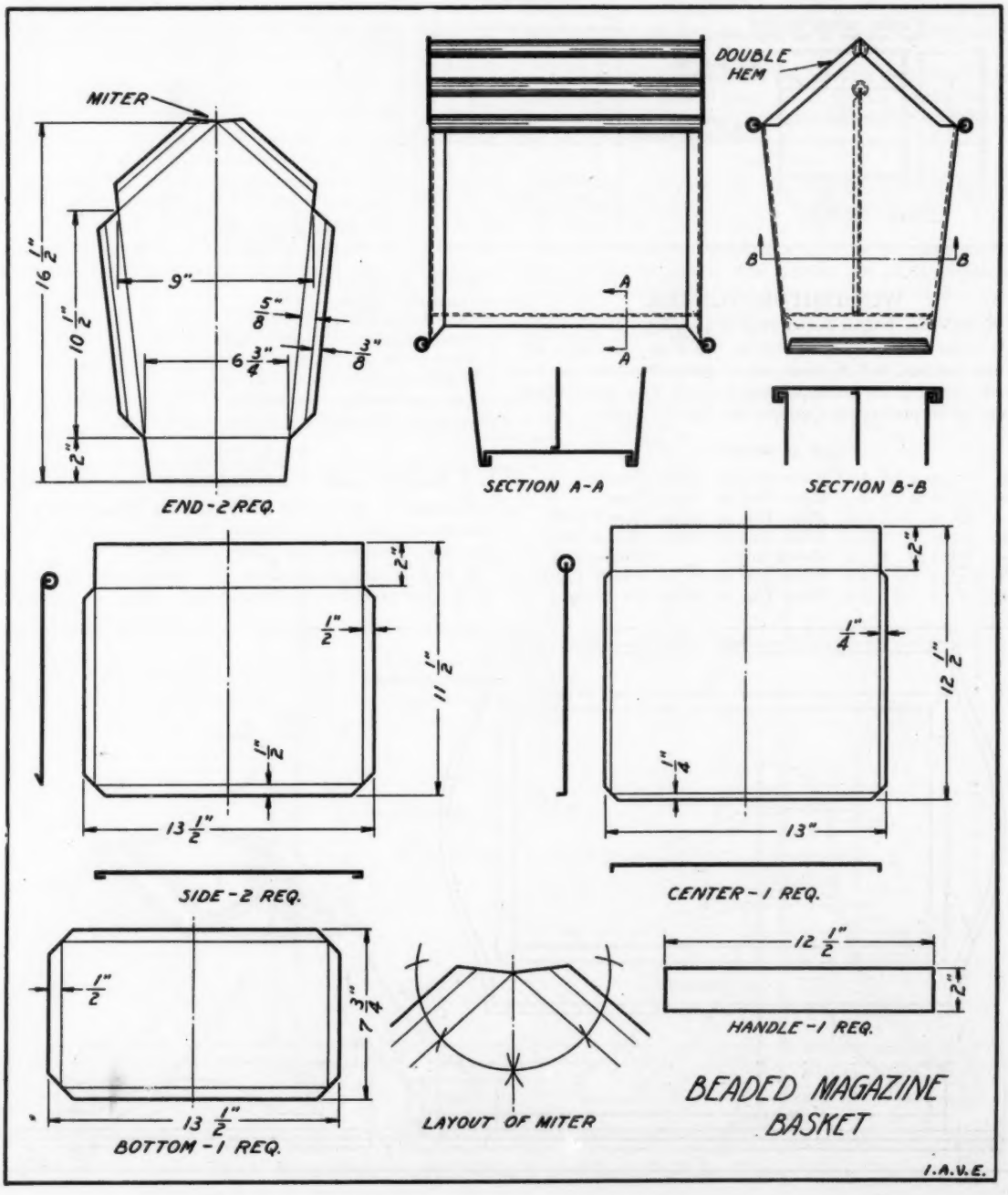
An important feature of the problem is that it allows the boy to develop and finish the problem according to his own individual initiative and desire. Such information as is necessary relative to good design and color harmony, should be introduced with the problem to bring about the desired result.

MAGAZINE BASKET

A. M. Helgerson, Roosevelt Junior High School, Charleston, West Virginia

This modernistic magazine basket has become very popular in our sheet-metal shops. It is made of 26-gauge galvanized iron and requires about 7½ square feet of metal. The outstanding characteristics of the project are that all its parts are rigid and strong, and it has no sharp edges or corners protruding to tear clothing and scratch furniture. Only a few sheet-metal projects possess these characteristics.

The beads on the top edges of the two sides and the center piece, and bottom edges of the ends are made on the gutter beader. However, if a gutter beader is not at hand, the beads can easily be rolled around a ½-in. rod. The handle is constructed on the gutter beader the same as the other five beads.



Many boys have finished these projects with a mahogany finish to match the furniture in their homes. This can be done by mixing a small quantity of red lacquer in black. Other finishes have proved desirable, such as blending various colors of lacquer by use of an ordinary Fly-Tox spray that is operated by mouth. This develops the student's art ability in blending colors.

The laying out of the various pieces offers a good lesson in drawing. Observe the miter joints in the hems on the end pieces.

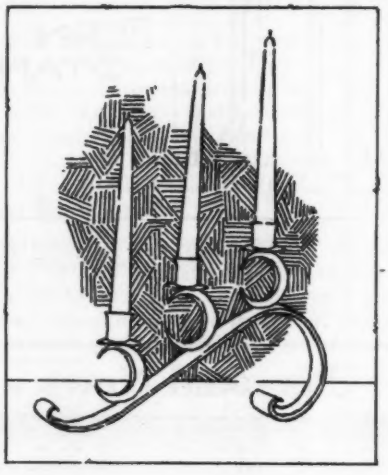
The handle is attached by soldering at both ends, leaving a good fillet of solder all around the joints. The center piece and bottom is fastened by spot soldering.

None of the operations in drawing or making this project are above the capacity of eighth-grade boys.

METAL CANDLE HOLDER

L. Henderson and H. G. Stintsman, High School, Bridgeton, New Jersey

A candlestick makes a very desirable project, and the one shown herewith developed a good deal of interest.



The boy is given a blue print from which he obtains the size for the main strip. This strip is cut to length and forged to shape on the anvil. The crescents and cups are made and assembled. The whole is then finished according to directions. The instructions are given individually, as the project is not made by all students.

This problem embraces the following operations in metal working: The use of the forge, anvil, hammer; center-punching; drilling; and riveting. When properly constructed and finished, this problem is welcome in any home.

SAVING TYPE ON IMPRINTS

R. Randolph Karch, Arsenal Junior High School, Pittsburgh, Pennsylvania

Most school printshops imprint their production work. As these imprints are, by necessity, set in very small type, it does not take very long to wear out almost a complete font of the fine sizes of type used. To do away with this, it is well to have these imprints made in matrix form for the linotype or intertype, and then cast up a galley or so of them at the beginning of each school year. These matrices may be had at a small cost, and if the school shop is not equipped with a slug-casting machine, a dollar or so is all that is necessary to have the local printer do the casting. The casting is done the same as making border, on any size of body.

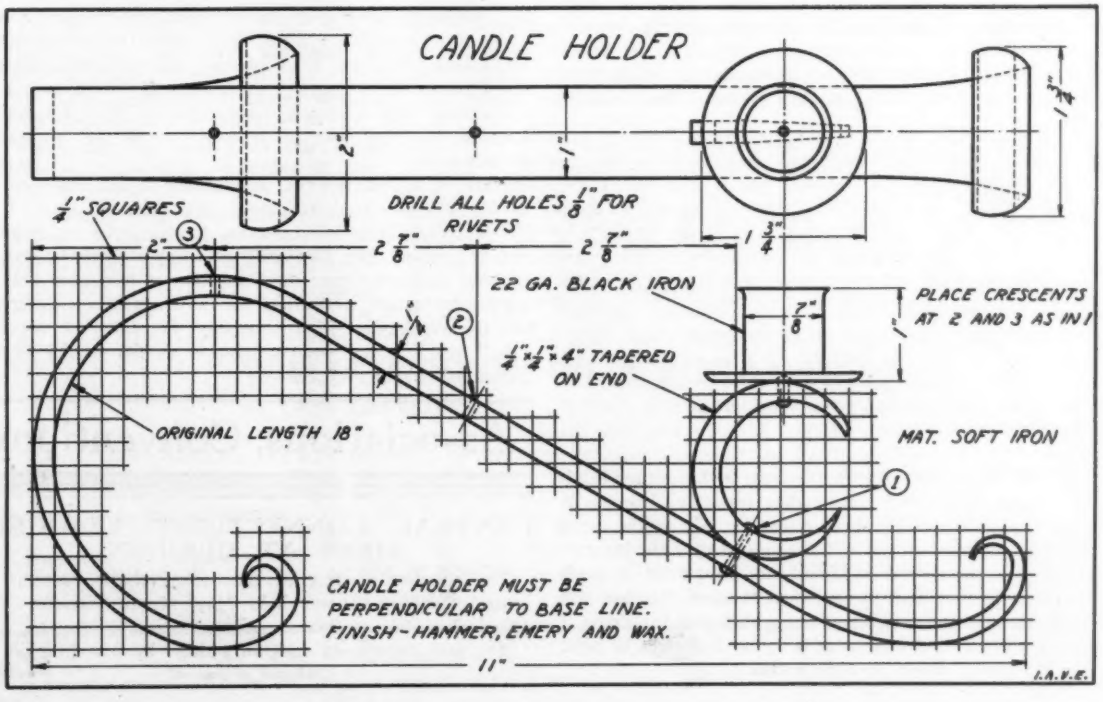
A SEDIMENT CAN

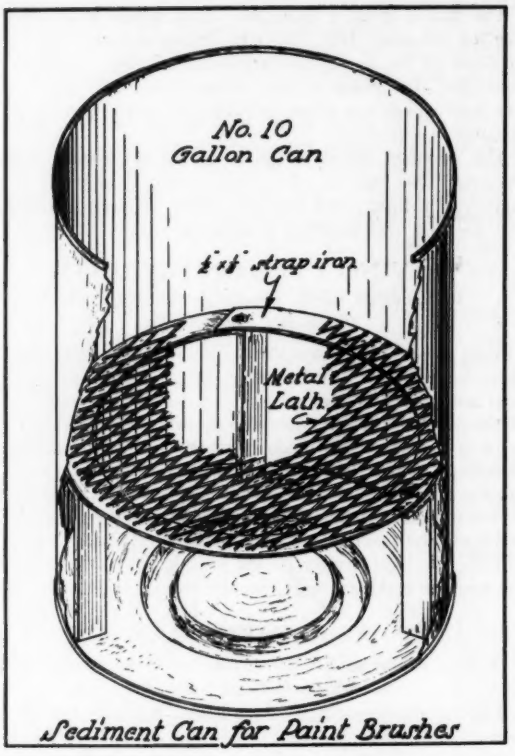
E. G. Livingston, Assistant Professor of Industrial Arts, Iowa State College, Ames, Iowa

The accompanying illustration shows a device that is convenient and economical in the finishing room. The materials consist of a No. 10 can, a piece of metal lath, and some ⅛ by ½-in. band iron.

The band-iron support is placed in the can and the disk of metal lath is placed on top of it. Gasoline or kerosene is then poured in to a depth of about 2 in. above the metal lath.

Brushes that have been used in paints, enamels, stains, or varnishes are first cleaned in the sediment can by working them across the metal lath under the liquid. They are then finished in a small amount of clean solvent which may be saved to refill the sediment can when it becomes necessary to do so.





Sediment Can for Paint Brushes

The sediment may accumulate to the depth of 2 in. in the can without noticeably thickening the liquid above the metal lath. An appreciable saving of materials used for cleaning brushes may be obtained with this simple piece of equipment.

METAL FERN STAND

H. O. Jaeger, Moline, Illinois

The fern stand illustrated and described herewith makes a very useful and acceptable project. The following method of procedure will be found helpful:

Make a layout of the top pieces on a board or a sheet of paper.

Cut the metal for all of the parts, using 3/16 by ¾-in. mild steel for the top, ½ by ½-in. for the legs, and ⅛ by ½-in. for all braces.

In forming the feet on the legs, heat the metal and place it on the anvil, allowing end of metal to project over the side of the anvil about 2 in.

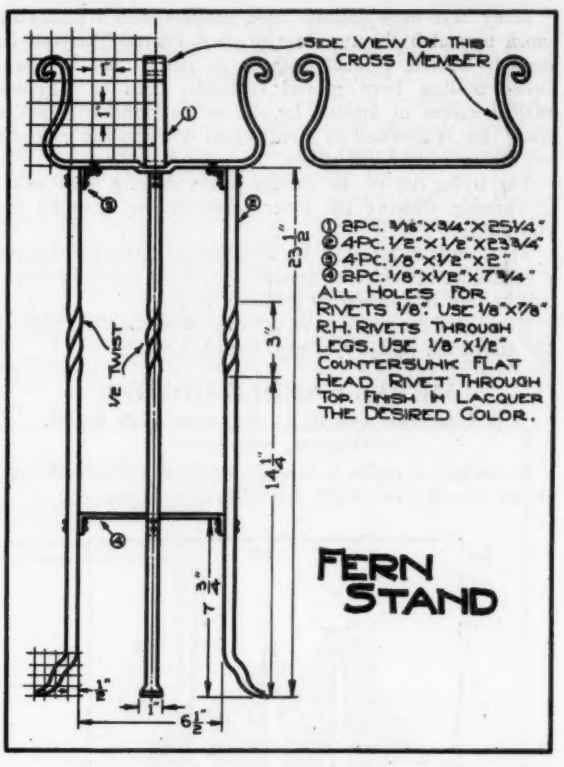
Hit with the hammer close to the side of the anvil. After the feet are shaped, flatten their ends out in the shape of a fan.

Mark off with chalk or white pencil where the twist is to be made, heat the metal and then place in vise on one line and place wrench on the other line, giving the metal a half, three-quarter, or a full twist, as desired.

Locate the rivet holes and drill them to ⅛-in. diameter. The top pieces may be bent with a bending fork made of a rod of the required diameter, into which a 3/16 by 1-in. slot has been cut.

The ends of the metal for the top must be heated for bending the small scrolls with the bending fork. The balance of the top may be formed by opening the vise, placing the metal over the opening and hitting with the peen part of the hammer until the required curve is obtained. An offset must be made in one piece so that both pieces, when fastened together, will be flush. Be sure and compare pieces with layout for shape.

Locate all holes and drill them to ⅛-in. diameter. All holes in the top pieces should be countersunk.



Assemble the two top pieces, then the lower braces to the legs, and then the top to the legs.

Finish by applying two or three coats of lacquer, rubbing each coat with No. 0 steel wool.

Personal News

¶ Mr. Verne C. Fryklund, of the University of Minnesota, recently received the Ph.D. degree from that University. Mr. Fryklund is a graduate of Missouri University, the Colorado Teachers' College, and The Stout Institute, Menomonie, Wis. He is at present instructor in industrial education at the University of Minnesota, is the author of a textbook, and a steady contributor to the professional literature of the field of industrial arts and vocational education.

¶ Mr. A. C. Blackwell, 28, auto-mechanics instructor in the Vocational School, Waukesha, Wis., died on June 12, in the Municipal Hospital, following fatal injuries in an automobile accident. Mr. Blackwell, who was a native of Michigan, was graduated from the University of Michigan. Following his graduation, he worked for the Nash Motor Company and the Waukesha Motor Company. For the past two and a half years he had been a member of the faculty of the vocational school.

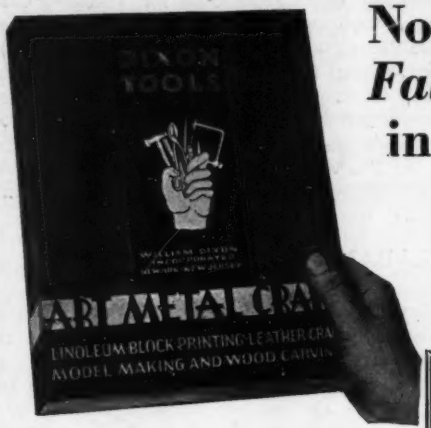
Associations, Conventions

CENTRAL CONNECTICUT TEACHERS MEET AT MERIDEN

The summer meeting of the industrial-arts teachers of central Connecticut was held May 17, at Meriden, with 45 members in attendance.

The meeting opened with an address by Mr. Franklin E.

(Continued on page 6a)



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"Of great value to Craft Teachers, as it has valuable suggestions as to the uses of tools and also processes. The reproduction of metal problems is also of interest to us."

"I do enjoy the text book, or rather, the student aid atmosphere of it."

"Will be very useful in our shop classes, as well as in ordering materials."

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(Continued from page 302)

Pierce, who spoke on "Qualifications for Teachers' Certificates in the Elementary, Junior, and Senior High Schools," giving a detailed report on the proposed junior-high-school qualifications. A brief review of manual arts was given from the time of its introduction into the schools and the proposed qualification for certification of teachers of industrial arts.

At the business meeting, Frank Corrigan, of Waterbury, mentioned the teachers' pension bill now before the legislature. A resolution was adopted, opposing the bill in its present form. — *Harry A. Barnicle, Secretary.*

ALABAMA INDUSTRIAL-ARTS TEACHERS MEET

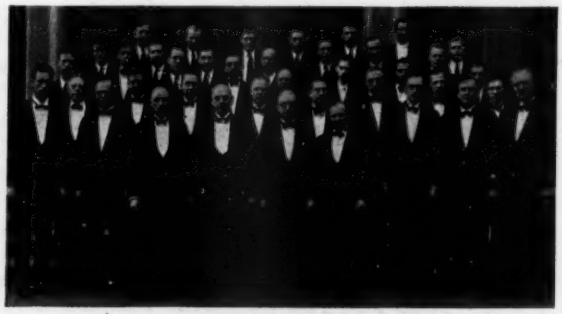
The Alabama Industrial-Arts Association held its meeting at Montgomery on March 31, 1933. Approximately forty teachers were in attendance.

Prof. Ben E. Harris, of the University of Alabama, spoke on the topic, "The Outlook of Industrial Arts Under the Present Economic Conditions." Mr. E. W. Walker, of Dothan, followed with a talk on "Industrial-Arts Conditions in the South." Mr. W. H. Coppedge, of the Alabama Polytechnic Institute, discussed "The Value of Publicity in Industrial Arts." The program was followed by a business meeting and a luncheon.

The new officers are: Prof. W. H. Coppedge, of Auburn, Ala., president; Mr. L. G. Fullington, of Birmingham, secretary, and Mr. A. H. Wiltshire, of Birmingham, treasurer. — *H. L. Weatherby.*

NEW EPSILON PI TAU CHAPTERS

This national honorary professional fraternity in industrial arts and vocational education installed the Iota chapters at State Teachers College, Charleston, Ill., on May 25, 1933. The initiation was under the direction of Prof. O. E. Sink, Ball State Teachers College, Muncie, Ind., and the charter members of this new chapter are the following: Neal A. Adkins, Lawrence F. Ashley, Walter C. Bertschinger, Charles A. Burnes, Robert H. Claybaugh, Raymond R. Hall, Harry R. Jackson, Russell H. Landis, Burl A. Lugar, Loren H. Petty, Raymond W. Phipps, Gilbert A. Rose, and Glen N. Titus.



Those present at the Theta Chapter Installation at the Stout Institute

Top Row: Raymond Johnson, Menomonie; Howard C. Olson, Menomonie; Eugene Doyle, Menomonie; Harland Woodworth, Menomonie; Charles Peterson, Menomonie; Irven Buss, Menomonie; Alvin Rolla, Menomonie. — Fourth Row: Frederick Curran, Menomonie; Everis Nelson, Menomonie; Ralph Betterley, Menomonie; Fred L. Curran, Menomonie; Norman Jensen, Menomonie; Earl Rogers, Grand Forks; Oren Stamstad, Menomonie. — Third Row: Robert Jensen, Menomonie; Roy Larson, Menomonie; Elbert Barnhart, Menomonie; Dewey Barich, Menomonie; Harry Kirn, Kenosha; Wayne Hughes, Menomonie; Aurilien Belanger, Menomonie; Paul Doyle, Menomonie. — Second Row: V. M. Russel, Platteville; Milo Oakland, De Kalb; Leonard Bollinger, Kenosha; Carl Cramer, De Kalb; Merle M. Price, Menomonie; Arthur Brown, Menomonie; Carl Swanson, De Kalb; William A. Shely, De Kalb. — Front Row: Harry Smith, De Kalb; Paul Harrison, De Kalb; Homer J. Smith, Minneapolis; Burton E. Nelson, Menomonie; Clyde A. Bowman, Menomonie; Elroy Bollinger, Grand Forks; Verne Fryklund, Minneapolis; William E. Warner, Columbus; Orville E. Sink, Muncie

Theta chapter was installed at The Stout Institute, Meno-

monie, Wis., on May 27, 1933. Again Prof. Sink had charge of the initiation, and the following were initiated as charter members: Dewey F. Barich, Aurilian J. Belanger, Clyde A. Bowman, Paul Q. Doyle, Wayne P. Hughes, Robert P. Jensen, Everis F. Nelson, Burton A. Nelson, Merle M. Price, Alvin Rolla, and Oren P. Stamstad.

Some Questions Answered

LYE AS A VARNISH REMOVER

968. Q.: Will you kindly furnish us with information for refinishing walnut that has had old finish removed with lye. The lye solution has left white spots on the wood. — *A.J.H.*

A.: In regard to the white spots which remain on walnut after removing the finish with lye, I am of the opinion that these have resulted from portions of the finish still remaining. Wherever an alkali is used in this manner it should be neutralized by subsequent treatment with an acid and in this case the most practical type available is apple-cider vinegar which may best be sponged on freely after reducing to half strength with hot water. The surface should be allowed to dry and then sanded to bring the wood to a solid surface since invariably the action of the lye is to soften the wood for at least 1/32 of an inch in depth. If this wood is not removed and traces of alkali completely neutralized, subsequent humidity in the atmosphere will produce a reaction which will readily destroy any applied finish. To be absolutely safe a second treatment with vinegar is frequently given after sanding the wood as described. When dried the wood may or may not be sanded as conditions warrant and any standard finish may be applied with reasonable safety. — *Ralph G. Waring.*

DARK FINISH FOR PHILIPPINE MAHOGANY

969. Q.: I would like to know the method used by furniture manufacturers for the finishing of Philippine mahogany in the dark finish. — *C.O.S.*

A.: Philippine mahogany can be given the standard dark finish as follows:

Sponge the wood to raise the rather pronounced grain, let dry and sand with a 4/0 finishing paper. Next, apply a hot solution of standard dark mahogany, using 4 oz. of stain powder per gallon of hot water. Let dry overnight. Size with a wash coat of orange shellac, made of 1 part of shellac to 5 parts of denatured alcohol. When dried, sand with a split 6/0 garnet finishing paper, dust off and fill with a dark brown silex base filler, using about 16 lb. of paste per gallon of thinner. Let dry overnight after having carefully cleaned off the excess filler, and, if necessary, refill to satisfactorily level the pores. Let all filler dry 48 hours in a warm room. Varnish two or three coats of the newer four-hour types, allowing an overnight dry between coats.

Sand between coats with the 6/0 garnet finishing paper. Rub the last coat, after a three-day drying, with FFF pumice stone, felt pad, and crude oil. Clean up with a good polish. — *Ralph G. Waring.*

New Publications

How to Draw in Pen and Ink

By Jasper Salwey. Cloth, 66 pages, 6⅛ by 9⅞, illustrated. Price, $2.50. Published by Bridgman Publishers, Pelham, New York.

This book explains in detail how to draw in pen and ink. The directions are plain and concise. A variety of techniques are shown. The examples of famous pen-and-ink artists are shown for the student's study and imitation.

(Continued on page 9a)

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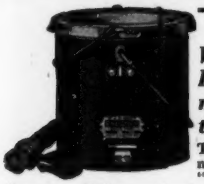

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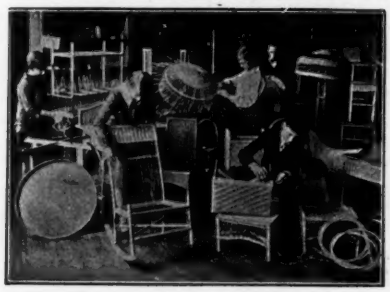

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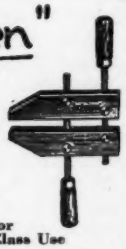

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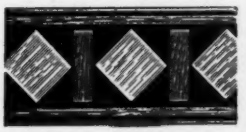
INLAY  INLAY

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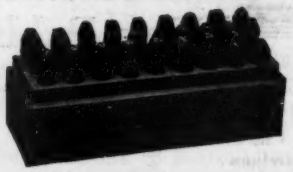

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(Continued from page 7a)

Automotive Repair

By J. C. Wright. Cloth, 312 pages, 6⅛ by 9¼, illustrated. Price, $3. Published by John Wiley & Sons, Inc., New York City.

This instruction manual of repair jobs for elecrical service men appears in its second edition and has been extensively revised. It is profusely illustrated and covers all of the usual repairs in job form.

SchoolShopEquipmentNews

A NEW FLEXIBLE-STEEL RULE

The Lufkin Rule Co., Saginaw, Mich., announces the new "Aristocrat" No. 186 tape rule. Although it is a practical 6-ft. rule, it weighs but 2 oz. and fits snugly into a case 1⅝ in. in diameter.

It is stiff enough to be projected unsupported, like a rule, used for measuring walls or wall openings, yet it will readily flex around and accurately measure circles. The No. 186 is graduated to 16ths of an inch, and the No. 186D carries in addition graduations in feet, 10ths and 100ths of feet for making engineering measurements. The case is of stainless steel with an embossed design and black enameled background.

NEW GENERAL SHOP PRINTING UNITS

The American Type Founders Company, Jersey City, N. J., are announcing a new general shop printing unit in three sizes, for 4, 6, and 8 pupils. These units are especially designed to meet the needs of small community schools, boys' clubs, and general shops in elementary and junior high schools.

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Only standard equipment is used in making up the units so that the plant can be enlarged from time to time as class requirements develop. The cost per unit which comprises type, press, cabinets, and accessories, is exceedingly low.

(Continued on page 11a)

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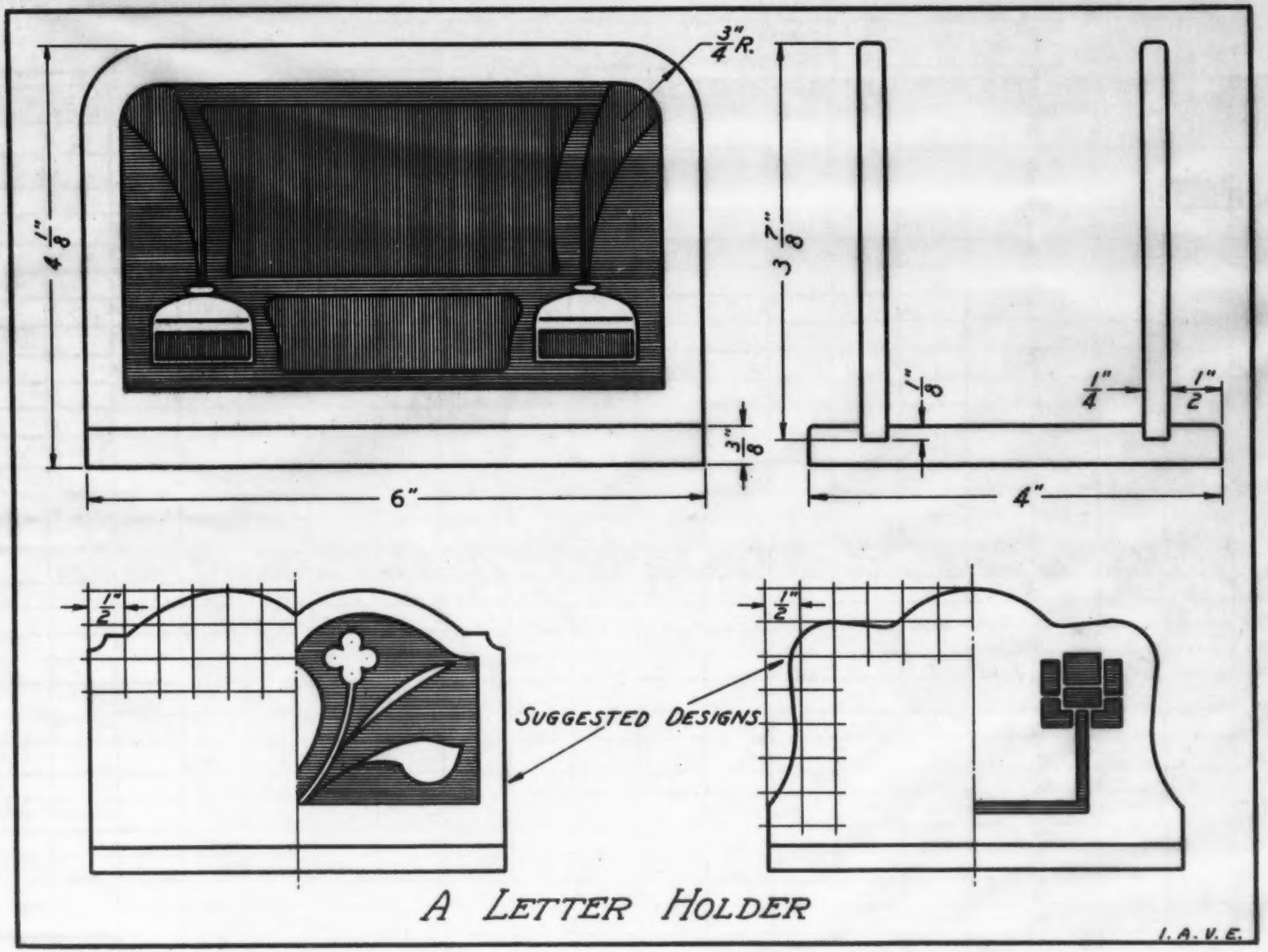

A LETTER HOLDER

I. A. V. E.

Designed by J. I. Sowers, Miami, Florida

Described Elsewhere in This Issue

Sept 1933
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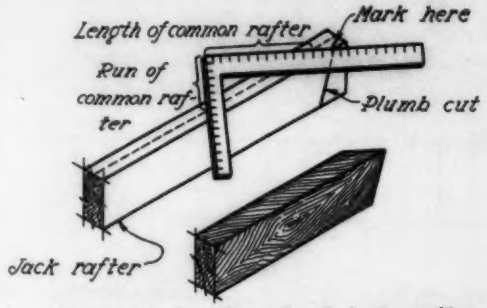
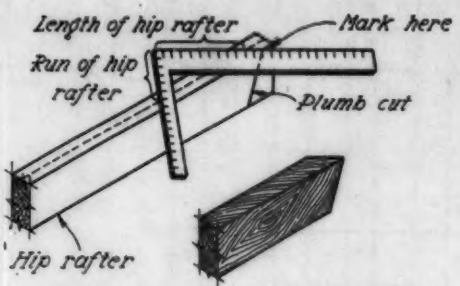
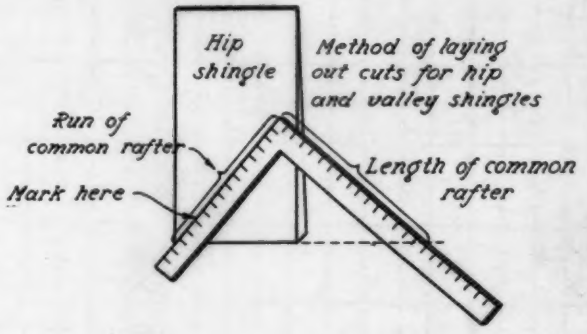


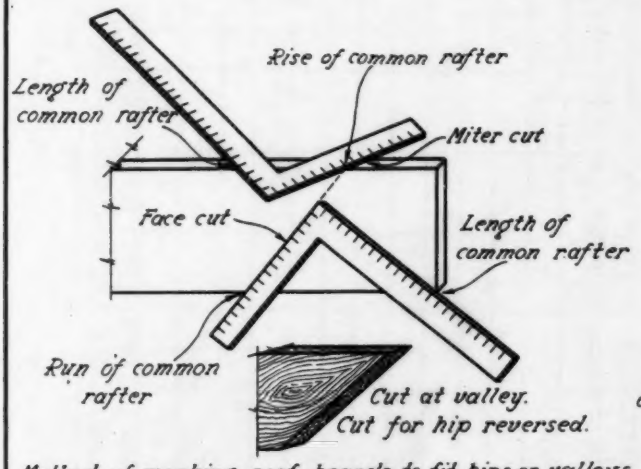
Laying out side cut of jack rafter



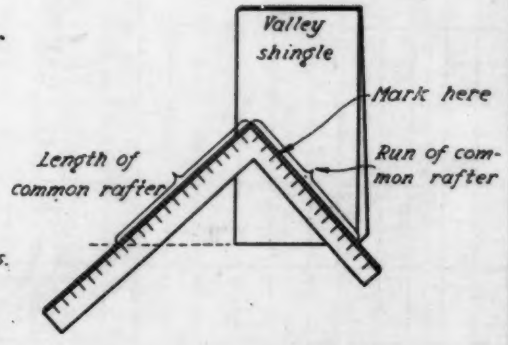
Laying out side cut of hip rafter

FRAMING CHART – TWO

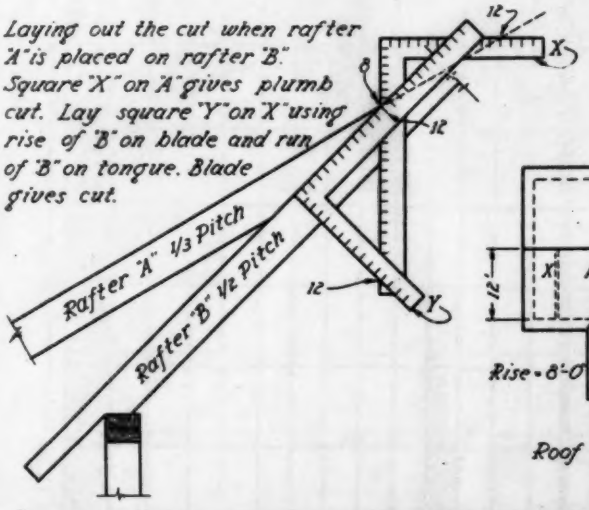


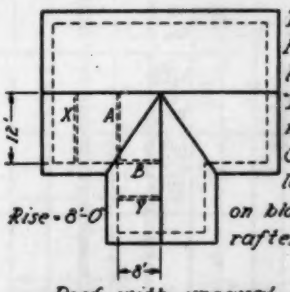


Method of marking roof boards to fit hips or valleys.



Laying out the cut when rafter "A" is placed on rafter "B". Square "X" on "A" gives plumb cut. Lay square "Y" on "X" using rise of "B" on blade and run of "B" on tongue. Blade gives cut.





To obtain side cuts of jacks: For side cut of jack "A" take length of common rafter "X" on blade and run of common rafter "Y" on tongue. Cut on blade. For jack "B" take length of common rafter "Y" on blade and run of common rafter "X" on tongue. Cut on blade.

Roof with unequal pitches

I.A.V.E.

Submitted by K. L. Julson, Butte, Montana